REPORT OF THE PLANNING COMMITTEE ON A PROPOSED

SQUAMISH ESTUARY MANAGEMENT PLAN

VOLUME ONE
THE PLAN

September 1982

Government of Canada Gouvernement du Canada

Province of British Columbia

BACKGROUND PUBLICATIONS
SQUAMISH ESTUARY MANAGEMENT PLAN

Air and Water Quality Work Group
Final Report

Habitat Work Group
Final Report

Land Use Work Group
Final Report

Recreation Work Group
Final Report

Squamish Estuary Draft Management Plan

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Prepared for consideration by the Minister of Fisheries and Oceans, Canada

and by the Minister of Environment, British Columbia

September, 1982

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REPORT OF THE PLANNING COMMITTEE ON A PROPOSED
SQUAMISH ESTUARY MANAGEMENT PLAN
EXECUTIVE SUMMARY

PREFACE

The intention to prepare a Squamish Estuary Management Plan was announced jointly in May 1979 by the British Columbia Minister of Environment and the Canada Minister of Fisheries and Oceans. The goal of the Plan is to provide a decision-making framework which can be used to guide land and water use in the Squamish estuary, but remain flexible to allow refinement in later years.

The Plan was proposed under the supervision of a Planning Committee, with the assistance of a Planning Work Group who were largely responsible for drafting a Plan proposal, while four technical Work Groups prepared reports related to air and water quality, land and water use, recreation, and habitat. Included in these reports were recommendations for estuary improvement, and for research or studies to improve decision-making.

PART I: THE SETTING

1.0 RESOURCES, DEVELOPMENT HISTORY AND JURISDICTIONS

The Squamish estuary is located at the head of Howe Sound, occupying over 600 hectares. The Squamish area is an area with many associated uses, thereby possessing many values. Several legislative jurisdictions covering a multitude of aspects are in effect in the Squamish area.

PART II: THE PLAN PROCESS

2.0 ADMINISTRATIVE ORGANIZATION AND ENVIRONMENTAL REVIEWS

Endorsement of the Management Plan as a broadly acceptable framework within which decisions concerning the use of the estuary will be made is the first step required to implement the plan. The support of the co-sponsors of the Management Plan, and the numerous other interests with a role to play in decisions regarding use of the estuary, will be necessary.

Implementation of the Management Plan will be based upon the use of existing legislation and regulations. It will be important to improve cooperation and coordination among government agencies, possibly by formalizing these relations through protocol agreements or memoranda of understanding. To support this process, industry should prepare plans which outline their long-term objectives within the estuary.

2.1 The Implementation Structures

2.1.1 The Coordinating Committee

Coordination throughout the implementation process will be provided through the Coordinating Committee and its secretary, the Implementation

Coordinator. The Committee will be responsible to the Federal and Provincial Ministers responsible for the preparation of the Plan. The Committee will be responsible for interacting with government, the private sector, and the public. The purpose of this interaction will be to develop or recommend overall policies, to encourage steps required to ensure actions of agencies or industry are consistent with the Management Plan, and to prepare a review every 5 years of the progress of the Management Plan. As well, the Committee will determine the type of environmental review required for proposed projects, review the results of such assessments, make recommendations to regulatory agencies, make recommendations on amendments to the Management Plan, identify funding and manpower requirements for various actions associated with implementation and review the costs of and priorize actions and studies recommended in Sections 4.0 and 5.0 respectively of the Management Plan.

2.1.2 The Implementation Coordinator

The Secretary to the Coordinating Committee will act as the Implementation Coordinator and will be responsible to the Committee. The Coordinator will be responsible for the implementation of the Plan, and will work closely with technical and advisory levels of government, the private sector, and the public to provide technical support to the Coordinating Committee. The Coordinator will also review completed outlines for development proposals and make recommendations for further assessments.

2.2 The Information Bank

A public repository (Information Bank) related to the Management Plan and its implementation will be established. The Information Bank will be updated with information obtained during implementation while providing an opportunity to enhance ongoing public involvement.

2.3 Amending the Management Plan

The need for refinement of the Management Plan recognizes that numerous deficiencies presently exist in the information required to manage the estuary effectively. The Management Plan will be amended as new information becomes available and decisions are made, to guide management decisions. Refinements to the Plan would include amendments to area designations, but these and other major amendments to the Plan will require review by the public, the private sector and government. The extent of review of amendments will be determined by the Coordinating Committee.

2.4 Environmental Impact Review

All regulatory agencies and representatives of project proponents would refer all proposals to the Coordinating Committee to enable the required level of environmental impact review to be determined, based upon conformance with the intent of the Management Plan. It is intended that review processes shall not duplicate already established and adequate processes (e.g., Energy Project Review Procedures).

The preparation of development proposal outlines by the proponent will be essential to determine the required level of environmental impact assessment, if any. On the basis of the review of the outlines, the Coordinating Committee will recommend approval or disallowance of the project, or recommend specific further assessment of the proposal.

An environmental impact assessment may involve the general assessment of alternatives regarding the design and location of a proposed facility, or a more site specific assessment to determine specific environmental implications of a preferred alternative for a project. The Coordinating Committee will appoint an Environmental Assessment Committee, who will advise the proponent during the preparation of the environmental impact assessment. The Environmental Assessment Committee will review completed environmental impact assessments and report to the Coordinating Committee. The public will have an opportunity to provide written comments to the Coordinating Committee during the proposed review period.

Upon completion of this process, the Coordinating Committee will make a single report containing all its recommendations regarding the proposal to the appropriate regulatory agencies with a copy being sent to the proponent. It is intended that appropriate recommendations will be incorporated into permits and approvals issued by relevant government regulatory agencies. Any recommendations which require a major amendment to the Management Plan will be forwarded to the Ministers for ratification, prior to release.

PART III: GUIDELINES FOR MANAGEMENT

3.0 POLICY GUIDELINES AND AREA DESIGNATION

3.1 Policy Guidelines

The policy guidelines are intended to complement rather than supercede existing statutes, regulations, and guidelines. It is recognized that all environmental impact reduction actions must in principle be cost effective as well as environmentally acceptable. Guidelines have been prepared related to the following topic areas: planning and decision-making, industrial site development, development of land and water uses, habitat protection and development, log handling and processing facilities, dredging and disposal of dredged material, research proposals and recreation.

3.2 Area Designations

The diverse resource base of the Squamish estuary provides a wide range of opportunities for an equally wide range of activities. Areas within the estuary have been designated for specific types of best use into the categories Conservation, Industrial/Commerical, or Planning Assessment. Concensus agreement by the Planning Committee was required before an area would be placed into either the Conservation or Industrial/Commercial. If agreement could not be reached regarding the appropriate designation, or if necessary information was lacking, the Planning Assessment designation was used. The present designations are primarily a recognition of existing resource and industrial values within the estuary. Each designation has a specific role to play in the provision of suitable sites for various activities, and each has a set of policies which refine and supplement the management policy guidelines.

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The Planning Committee wishes to acknowledge the many agencies and individuals who contributed to the preparation of this document through their participation on the various work groups, through their submissions to the Planning Committee and the work groups and through the various other contributions they made to production of this report.

The technical specialists in the Recreation Work Group, Air and Water Quality Work Group, Habitat Work Group and Land Use Work Group played a major part in assembling the information required for preparing this Management Plan. The work of the Planning Work Group in drawing together the material assembled by the technical work groups mentioned above and by the Public Involvement Work Group was a great assistance to the Planning Committee. The Public Involvement Work Group, through its involvement during the development and review of the Draft Management Plan, has contributed to the improvement of the Plan. This report is based substantially on material contained in a draft submitted by the Planning Work Group.

The Planning Committee has placed its own interpretation and conclusions on the material made available to it, and assumes sole responsibility for the Management Plan it has recommended. The contents of this report do not necessarily reflect the policies of the governmental agencies represented on the Planning Committee or any other private or governmental agency.

PREFACE

In May, 1979, the British Columbia Minister of Environment and the Canada Minister of Fisheries and Oceans announced their decision to develop a Squamish Estuary Management Plan. They directed that a Planning Committee be established to prepare the Plan and that it include representatives of the federal, provincial and municipal governments and private industry. An independent consultant, Mr. W. Winston Mair, was appointed to review the report of the Planning Committee and advise the two Ministers.

The terms of reference of the Planning Committee provide for the participants to work together to develop a plan for the use of the estuary that would optimize resource/habitat values while providing for the long-term trade, development and energy requirements of the community and province. The organizational framework for the planning process is presented in the terms of reference of the Planning Committee (Appendix A).

The goal of the Squamish Estuary Management Plan is to provide a decision-making framework which can be used to guide land and water use in the Squamish Estuary. The Management Plan is intended to be ongoing and flexible in order to allow refinement as more information becomes available. To this end, it includes suggestions for the resolution of certain existing resource conflicts and recommendations for improved procedures and further research and analysis. Therefore, the Management Plan provides a decision-making framework for managing the use of the estuary rather than a rigid land and water use plan.

The Management Plan consists of three major parts:

1. the resource, historical and jurisdictional setting;
2. the plan process for coordinating the involvement of agencies and other interests; and
3. the guidelines for management

These are contained in Volume One. Collectively, these components provide an opportunity for the resolution of existing resource use conflicts and for guiding future estuary management decisions. Volume Two of this report consists of appendices containing supporting information.

A glossary of terms is provided at the back of Volume One to clarify the technical terminology used in the report.

The lands within the management plan area are held in part by the Crown Provincial and in part by corporations and/or private owners. It is not the intention of this Management Plan to address itself to compensation to the owners of the lands for loss by reason of implementation hereof.

Part I The Setting

PART I: THE SETTING

1.0 RESOURCES, DEVELOPMENT HISTORY AND JURISDICTIONS

Due to their suitability for a wide variety of uses and activities, estuaries in British Columbia are the setting for many resource use conflicts. An estuary is a highly productive biological resource which plays an important role in coastal ecology. Characteristics such as a gentle gradient, a broad sheltered intertidal zone and the mixing of fresh and saline water combine to provide valuable habitat for many species of aquatic and terrestrial plants and animals. The flat topography and sheltered shores associated with an estuary are also attractive for economic development opportunities such as port facilities and commercial/industrial activities which benefit from a coastal location. Because human settlements also tend to cluster on the coast, often in or near estuaries, the resulting urbanization brings about demands and impacts associated with concentrated populations, such as recreation, wastes, housing, agriculture and secondary industries. It is within the context of this mutual dependence on the estuary that the need for a more planned approach to the allocation and management of resources in the Squamish estuary arises.

1.1 Biophysical Resources

The Squamish estuary's features are well described in the Squamish report of the special estuary series prepared by the Canada Department of Fisheries and Environment in 1975.

The Squamish estuary is located at the head of Howe Sound, approximately 50 kilometres north from Vancouver, British Columbia. The Squamish River and its major tributaries, the Cheakamus, Mamquam and Elaho Rivers and Ashlu Creeks drain a total area of 3589 square kilometres. The Stawamus River which enters on the east side of the estuary, drains an additional 62 square kilometres. The study area is outlined in Figures 1 and 2.

The Squamish estuary, including the deltaic lands adjacent to the Mamquam Channel, occupies over 600 hectares. It is characterized by extensive low elevation marshlands, sand and mudflats which are intersected by the main river channel, the old Mamquam River Channel, smaller flood channels, and intertidal drainage channels. The area possesses a complex plant community common to developing alluvial lands. Stands of mixed deciduous and coniferous trees have established on the higher, infrequently flooded uplands. These uplands are bordered seaward by both pure and mixed plant communities dominated by sedges, grasses and rushes, which are typical of areas inundated by fresh or brackish water.

The Squamish River system supports four species of Pacific salmon - chum, chinook, coho, and pink. It is estimated that the present salmon resource of the Squamish River totals 572,000 fish. Of this total, 198,000 spawners produce an annual commercial catch of 266,000 fish, a saltwater sport catch of 104,000 fish, and an Indian food fishery catch of 4,000 fish. This resource represents an annual commercial net wholesale value, at 1978 prices, of $2,297,935. The net wholesale value is the gross wholesale value

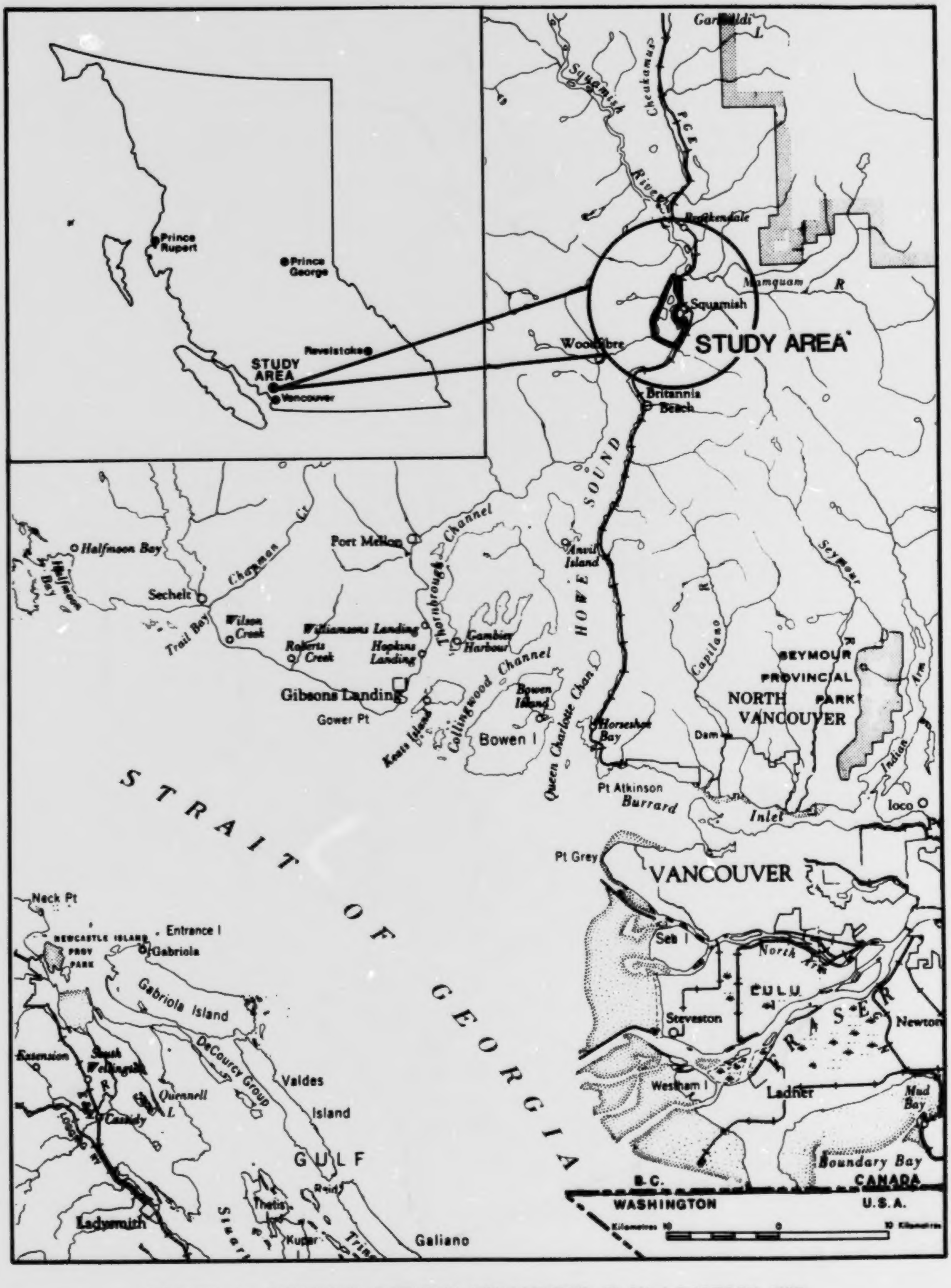
Prince Rupert
Prince George
Revelstoke
STUDY AREA
Vancouver
Garibaldi L
Squamish River
Cheakamus
PGE
Brackendale
Mamquam R
Squamish
STUDY AREA
Woodfibre
Britannia Beach
HOWE SOUND
Port Mellon
Thornbrough Channel
Halfmoon Bay
Sechelt
Chapman Cr
Trail Bay
Wilson Creek
Williamsons Landing
Roberts Creek
Hopkins Landing
Gambier Harbour
Gibsons Landing
Gower Pt
Keats Island
Collingwood Channel
Bowen Island
Bowen I
Queen Charlotte Chan
Horseshoe Bay
Anvil Island
Capilano R
Seymour
SEYMOUR PROVINCIAL PARK
NORTH VANCOUVER
Dam
Indian Arm
Pt Atkinson
Burrard Inlet
Ioco
Pt Grey
VANCOUVER
STRAIT OF GEORGIA
Sea I
North Arm
LULU
Steveston
FRASER
Newton
Westham I
Ladner
Mud Bay
Boundary Bay
B.C.
CANADA
WASHINGTON
U.S.A.
Kilometres 10 0 10 Kilometres
Neck Pt
NEWCASTLE ISLAND PROV PARK
Entrance I
Gabriola
Gabriola Island
DeCourcy Group
Valdes Island
Extension
South Wellington
Quennell L
Cassidy
GULF
Thetis
Reid
Kuper
Galiano
Ladysmith

FIGURE 1 SQUAMISH ESTUARY MANAGEMENT PLAN LOCATION MAP

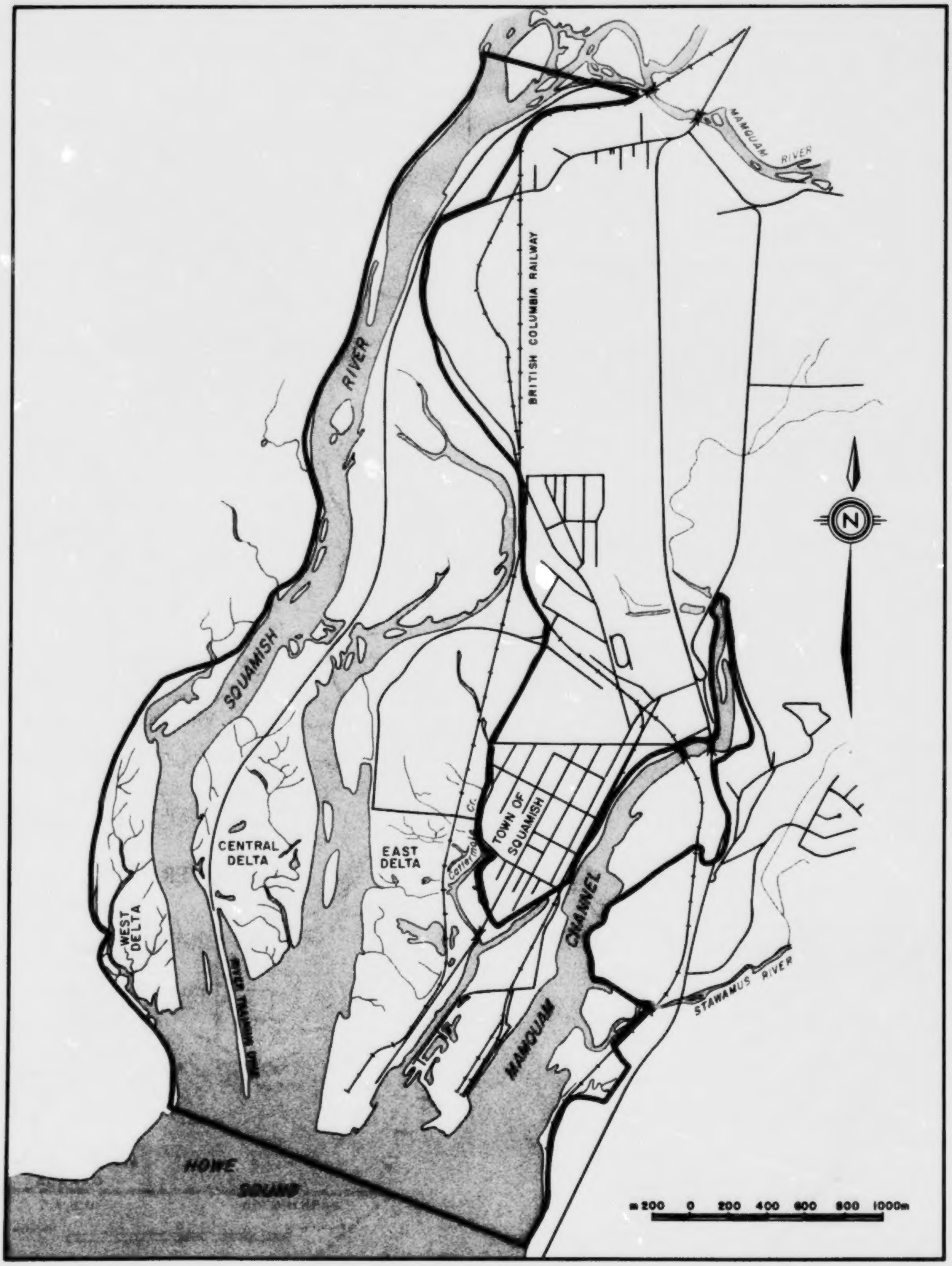
MAMQUAM RIVER
BRITISH COLUMBIA RAILWAY
SQUAMISH RIVER
N
CENTRAL DELTA
EAST DELTA
WEST DELTA
TOWN OF SQUAMISH
Cattermole Cr.
MAMQUAM CHANNEL
STAWAMUS RIVER
RIVER TRAINING DYKE
HOWE SOUND
m 200 0 200 400 600 800 1000m

FIGURE 2 STUDY AREA

of the processed product minus the harvesting and processing costs (1978 prices and costs). The Squamish River also supports a major freshwater sport fishery centered on steelhead trout, searun cutthroat trout, Dolly Varden char and coho salmon. The number of coho caught by sports fishermen in the Squamish systems is estimated at between 800 and 1,000 fish per year. Over 6,000 angler days per year are spent in the pursuit of steelhead trout.

The rearing of juvenile salmonids in estuaries in British Columbia has been documented by several studies. Those on the Squamish estuary have indicated that salmonids rear in the estuary and utilize an insect/amphipod food source which is dependent on algae and sedge production on the delta. These studies also indicated that the central basin contains the most valuable habitat for juvenile salmonids in the estuary.

A number of wildlife species depend upon the Squamish estuary and these have values related to recreational uses such as nature observation and hunting. Other recreational uses of the estuary include shallow-draft boating, walking and camping.

1.2 Economic Development

Since the turn of the century the Squamish area has been primarily dependent upon the forestry, mining and transportation sectors of the economy.

The forestry industry has provided the incentive for a large portion of development within the estuary. This influence is characterized by the Weldwood of Canada sawmill, the MacMillan Bloedel logging division operation, the nearby Woodfibre pulpmill, and the extensive use of Mamquam Channel for a variety of log handling activities.

The linking of Squamish to other British Columbia communities by rail has been an extremely important factor in the development of the community. In 1909, construction of the Howe Sound and Pemberton Valley Northern logging railway was completed. This line was purchased by the Pacific Great Eastern Railway (P.G.E.) in 1912. Construction between Squamish and Lillooet was completed in 1915. Shortly thereafter, the provincial government purchased the P.G.E. and extended the line from Lillooet to Quesnel. Later extensions to Prince George, the Peace River Region and North Vancouver increased the influence of rail transportation on the Squamish economy and fostered a desire for port facilities to complement the rail network.

Port development began in the early 1970's and included the dredging of the main channel of the Squamish River, construction of the river training dyke, and establishment of the Squamish Terminals forest products shipping facility. A proposed further expansion at the Squamish Terminals site was suspended in 1972 because of concern over the impact of this type of activity on the biological resources of the estuary.

The development of industrial activities has resulted in major modifications to the physical characteristics and biological productivity of the estuary, while at the same time significantly affecting the structure of the local economy.

The key factor affecting industrial land use demand and economic growth in Squamish is continued port development. Squamish Terminals is operating at full capacity for pulp shipping and handling, and proposes expansion of the facility through further landfill. Additional port development would provide opportunities to meet the provincial demands for these facilities.

There also exists a continuing need for assured tidewater booming, storage, and transportation sites for logs at Squamish, and a growing demand for marinas and public boat launch ramps for recreational use.

1.3 Jurisdictions

Decisions regulating the use of the Squamish estuary take place within a complex system of jurisdictional authority which guides the legislative and administrative actions of federal, provincial, regional and local levels of government. These have not been substantially affected by the proclamation of the Constitution Act, 1982. This Act modernizes the British North America Act, 1867 and all revisions thereto, renaming it the Constitution Act.

The Constitution Act, formerly known as the British North America Act, separates the respective jurisdictional authority of the federal and provincial governments. However, several areas of mutual jurisdiction exist between the federal and provincial governments.

The authority of any government agency is based upon legislation (statutes) that describes the responsibilities and powers which are the basis of the agency's policies and practices. This authority may be further defined by regulations, bylaws, guidelines, statements of administrative procedures and court decisions. Thus any agency will often be able to address only one aspect of a particular issue. As agencies of their legislated responsibilities, their decisions may conflict with the objectives of other agencies.

The rights of the private property owner are protected through common law. However, this is constrained in practice due to the influence of existing regulatory statutes.

The following is a summary of the government agencies and statutes which influence land and water uses in the Squamish estuary. A more detailed description for reference purposes can be found in Appendix C.

1.3.1 Federal

Federal jurisdiction specified in the Constitution Act includes responsibility for navigation and shipping, protection and management of fisheries and migratory birds, lands reserved for native people, and matters of national concern. The federal government does not possess proprietary (ownership) jurisdiction in the Squamish estuary but does have indirect control over estuary use through the regulatory powers of the following agencies.

1.3.1.1 Fisheries and Oceans Canada

a) Field Services Branch

The Fisheries Act provides this agency with a mandate to manage and protect fishery resources and supporting habitat and to investigate and regulate activities which might prove detrimental to these resources.

b) Small Craft Harbours Branch

This Branch operates the Federal Fishing and Recreational Harbours and may assist in the development of public marinas through the provision of breakwaters and dredging. Up to 50% of the capital cost of an approved project may be funded. The Fishing and Recreational Harbours Act provides the basis for this program.

1.3.1.2 Transport Canada

a) Canadian Coast Guard

This agency administers the Navigable Waters Protection Act which requires the approval of the Minister of Transport for any project or activity which restricts free navigation of a navigable water.

1.3.1.3 Environment Canada

a) Environmental Protection Service

This Service administers Section 33(2) of the Fisheries Act pertaining to the deposition of deleterious substances through the application of regulations and site specific requirements.

In addition, this Service also administers: the Ocean Dumping Control Act, which regulates the dumping of substances to marine waters; the Environmental Contaminants Act, which regulates the release, importation and manufacture of substances considered to be contaminants; and the Clean Air Act, which authorizes control of emissions considered hazardous to public health and the environment.

b) Canadian Wildlife Service (C.W.S.)

This agency is concerned with the management and conservation of migratory birds and bird habitat through the Migratory Birds Convention Act. The Canadian Wildlife Act enables the federal government to acquire and enhance habitat of importance to migratory birds.

c) Inland Waters Directorate (I.W.D.)

The Directorate is responsible for the implementation of the national flood damage reduction program. Implementation of the program is achieved through agreements with the Provinces and Canada under the Canada Water Act.

The main thrust of the program is to map areas prone to flooding and to designate jointly flood risk areas. A federal-provincial agreement has not yet been completed with British Columbia.

1.3.1.4 Public Works Canada

This Department acts as a design and construction agency for other federal agencies who require their services.

1.3.1.5 Federal Environmental Assessment and Review Office (F.E.A.R.O.)

The federal government has also established a policy for assessing the environmental impacts of projects which it sponsors. This policy, established by the Federal Cabinet and administered through the Federal Environmental Assessment and Review Office, provides an opportunity for projects undertaken by a federal agency or requiring federal funds to be subject to the Federal Environmental Assessment and Review Process (EARP).

1.3.2 Provincial

Provincial proprietary jurisdiction as defined under the Constitution Act applies to all land, water, forests, minerals, and land covered by those waters defined as inland waters, including the foreshore (intertidal zone). Other areas of jurisdiction conferred to the Province under the Act include municipal institutions, property and civil rights, local public works, and generally all matters of a local or private nature. These jurisdictions are administered by the following agencies:

1.3.2.1 Environment and Land Use Committee

The Environment and Land Use Act empowers the Environment and Land Use Committee of Cabinet to establish programs to foster public concern and awareness of the environment, to ensure that all aspects of preservation and maintenance of the natural environment are fully considered in the administration of land use and resource development, and to study any matter pertaining to the environment and land use.

1.3.2.2 Ministry of Lands, Parks and Housing

This agency has primary responsibility for Crown land and foreshore allocation. Under the Land Act, which establishes the procedures for the desposition of Crown Land (including lands covered by water), the Ministry of Lands, Parks and Housing is permitted to reserve, allocate, lease and grant foreshore areas for specified purposes. The Ministry's jurisdiction in the Squamish estuary is limited to the Crown land and foreshore in Mamquam Channel, the Squamish River channel and an isolated parcel in the East Delta.

This Ministry also has jurisdiction over ecological reserves. The Ecological Reserves Act recognizes that it is highly desirable in the public interest to set aside and reserve areas of Crown land representative of distinctive ecosystems for present and future scientific study, and provides for implementing the arrangements for that purpose.

1.3.2.3 Ministry of Environment

The Ministry of Environment is empowered under the Environmental Management Act, to develop management plans and environmental guidelines, to acquire information relative to environmental impact and protection and to take action to prevent environmental damage. This Act also provides for a process to hear appeals to decisions made under environmental legislation.

a) Fish and Wildlife Branch

Under the Wildlife Act, this Branch has the authority to act on matters that affect resident or migratory wildlife within provincial boundaries. This Branch is also delegated responsibility by the federal government for resident fish and anadromous trout, char and other non-salmon species under authority of the federal Fisheries Act.

b) Waste Management Branch

The principal means by which the provincial government controls the pollution of water, air and land is provided under the Waste Management Act. The Act requires that activities involving the discharge of sewage over 18.925 m^3 per day (5,000 gallons per day) or other waste material and contaminants to land, water or the atmosphere cannot proceed without a permit or approval from the Waste Management Branch. The Waste Management Act, which has superceded the Pollution Control Act, transfers power for issuance of permits from the Director to the Regional Managers and requires that municipalities develop a waste management plan for approval by the Minister of Environment detailing how wastes will be handled.

c) Pesticide Control Branch

This agency administers the Pesticide Control Act which governs all aspects of the sale and use of insecticides, herbicides and other pesticides within British Columbia.

d) Water Management Branch

This agency administers the Water Act, which governs the use of water in British Columbia, including natural sources of surface water, lakes, streams and groundwater. Under the Act, a water licence is required for water uses ranging from domestic water supply to large scale dams. A licence is issued for a particular purpose, from a particular source and, where applicable, for a specified quantity.

This agency also administers provisions of section 82 of the Land Title Act regarding approval of subdivision plans to promote flood damage control and floodplain development control.

This agency may be involved in the national flood damage reduction program (see 1.3.1.3 c).

Provincial jurisdiction also extends to the construction and use of dykes. The Dykes Maintenance Act established the office of the Inspector of Dykes, with responsibility to approve dykes and all works constructed in, around or through them, and to inspect the condition of dykes so proper maintenance can be assured.

1.3.2.4 Ministry of Attorney General

a) Registrar of Titles

The Land Title Act, administered by the Registrar of Titles outlines the procedures and specifications required for the subdivision of lands and their registration. Flood protection is also facilitated under this statute through its provisions for review and approval by the Ministry of Environment of subdivision plans in flood prone areas.

1.3.2.5 Ministry of Health

Sewage discharge systems, such as septic tank systems, which receive only domestic type wastes and are smaller than 22.7 m^3 per day capacity, whether the wastes come from a private residence, or a commercial or industrial source, are regulated under the Health Act. The administration of these provisions is usually done by local Health Units.

1.3.2.6 Ministry of Municipal Affairs

The Municipal Act requires the adoption of official community plans which are to be deposited with the Inspector of Municipalities. Zoning by-laws cannot be at variance with an official community plan. By-laws related to imposing development costs on subdivisions and certain building permits must receive approval from the Inspector of Municipalities.

1.3.3 Municipal and Regional

1.3.3.1 Squamish - Lillooet Regional District

The powers of the Regional District are described in the Municipal Act which is administered by the Provincial Ministry of Municipal Affairs.

These powers relate to those land and water use planning and management functions which transcend local community responsibilities. The Act provides for the preparation of an Official Regional Plan.

1.3.3.2 District of Squamish

The Municipal Act provides the authority for local governments to prepare land use plans and implement them through zoning and subdivision by-laws and development permits. Land use within the District of Squamish boundaries has been regulated until 1981 under the provisions of Zoning By-Law #277 and its amendments. However, the District of Squamish is in the process of finalizing an Official Community Plan.

1.3.4 British Columbia Railway Corporation

Most of the Squamish estuary is owned by British Columbia Railway, a Crown corporation responsible to the provincial Cabinet represented by the Ministry of Industry and Small Business Development. As an intra-provincial railway, British Columbia Railway's operations are subject to regulation under the British Columbia Railway Act administered by the Ministry of Transportation and Highways. The corporation was established under the British Columbia Railway Incorporation Act and can acquire land for the purposes of serving its long-term needs. The Corporation has leased or sold certain portions of existing holdings in the estuary which are ancillary to its foreseeable operational requirements.

Part II The Plan Process

PART II: THE PLAN PROCESS

2.0 ADMINISTRATIVE ORGANIZATION AND ENVIRONMENTAL REVIEWS

This portion of the Management Plan is intended to provide a means for coordinating the procedures of decision-making agencies for exercising their jurisdictional mandates and implementing the management guidelines recommended in Part III.

Successful implementation of the Management Plan will require the participation of all parties involved in decisions regarding the use of the estuary. Decision-making agencies will be expected to administer their policies and procedures in conformance with the intent of the Management Plan and to cooperate in coordinating their administrative procedures. Land owners, businesses, and other interested parties will be expected to keep administrators informed of activities, plans, and long-range objectives affecting land use within the estuary. Participation in the planning process is, to a large extent, voluntary. Therefore it is essential that the process operates in ways which will preserve the willingness of all parties to cooperate voluntarily. This requires that all parties share relevant information. It also requires that all parties exercise discretion respecting their use of shared information.

Implementation of the Management Plan will be based on the use of existing legislation and regulations. Those agencies with jurisdictional responsibilities in the estuary will continue to exercise their decision-making authority. However, as noted above, it is expected that these agencies will administer their existing policies and procedures in conformance with the intent of the Management Plan. This could be done by incorporating Management Plan recommendations into permit or approval requirements; establishing resource management and research objectives; and refining referral systems. Special consideration should be given to making arrangements to participate in those studies and actions in Sections 4.0 and 5.0 which will be identified by the Coordinating Committee as requiring priority attention. All the foregoing will aid in the resolution of existing conflicts regarding use of the estuary and reduce the probability for conflict in the future.

In conjunction with the adjustment of individual agency practices and procedures, it will also be important to improve cooperation and coordination among government agencies. In addition, it may be useful to formalize inter-agency relations through protocol agreements or memoranda of understanding. These documents would identify interagency conflict areas and would establish procedures for improving cooperation and coordination and resolving conflicts.

To support the adjustments which will be made by agencies with responsibility in the estuary, land owners, businesses and other interests should keep the Coordinating Committee informed of any of their activities or plans which could affect land or resource use within the estuary. One of the most important objectives of the Management Plan is to create a climate which encourages the development and implementation of a long-term strategy for industrial and commercial activities within the estuary. Accordingly, the Coordinating Committee should also be kept informed of long-term objectives and plans.

2.1 The Implementation Structures

Coordination throughout the implementation process will be provided through the Coordinating Commitee and the Implementation Coordinator. The relationship of these to the existing authorities is shown in Figure 3.

2.1.1 The Coordinating Committee

The Coordinating Committee will operate under approved terms of reference regarding its responsibilities and administrative procedures to supplement the general guidance provided in Part II. The terms of reference should allow for sufficient discretionary authority to account for those aspects of implementation which cannot presently be anticipated. The Coordinating Committee would not properly make recommendations respecting which some government agency does not have the power to act.

The Coordinating Committee will be responsible for interacting with government, the private sector and the public, to develop or recommend

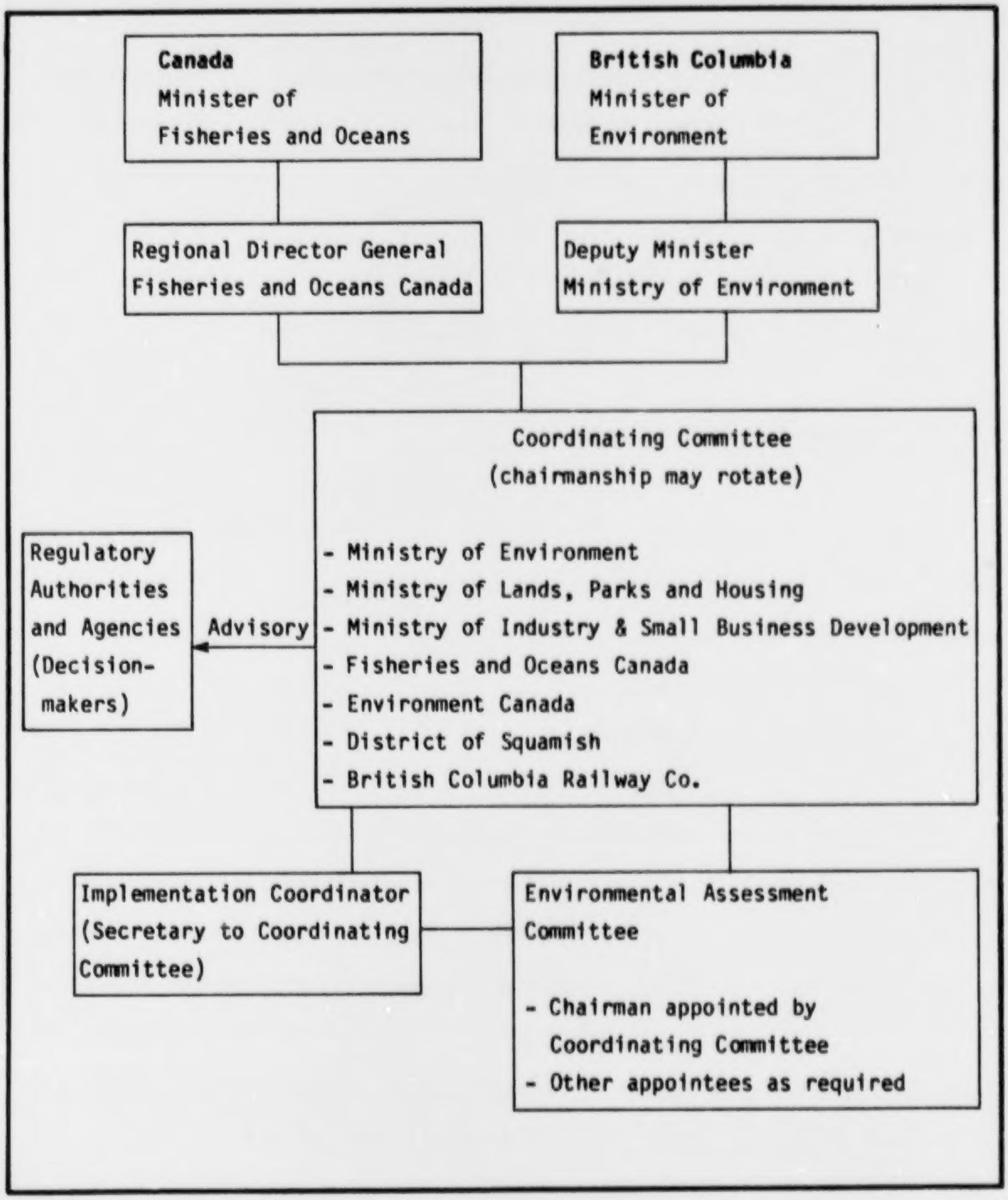
Canada
Minister of
Fisheries and Oceans
British Columbia
Minister of
Environment
Regional Director General
Fisheries and Oceans Canada
Deputy Minister
Ministry of Environment
Coordinating Committee
(chairmanship may rotate)
- Ministry of Environment
- Ministry of Lands, Parks and Housing
- Ministry of Industry & Small Business Development
- Fisheries and Oceans Canada
- Environment Canada
- District of Squamish
- British Columbia Railway Co.
Regulatory
Authorities
and Agencies
(Decision-
makers)
Advisory
Implementation Coordinator
(Secretary to Coordinating
Committee)
Environmental Assessment
Committee
- Chairman appointed by
Coordinating Committee
- Other appointees as required

FIGURE 3 ADMINISTRATIVE ORGANIZATION FOR IMPLEMENTATION

overall policies related to the Squamish estuary and to encourage steps required to ensure that agency and industrial actions conform to the intent of the Management Plan. The Coordinating Committee will determine the type of environmental review required (see Figure 4) for proposed projects, review the results of required environmental assessments, make recommendations to regulatory agencies, make recommendations on amendments to the Management Plan and identify funding and manpower requirements for the various actions associated with implementation. The Coordinating Committee will review the costs of and priorize actions and studies proposed in Sections 4.0 and 5.0 respectively.

The Coordinating Committee will be comprised of one representative from each of the following: B.C. Ministry of Environment, Canada Department of Fisheries and Oceans, B.C. Ministry of Lands, Parks and Housing, B.C. Ministry of Industry and Small Business Development, Canada Department of the Environment, British Columbia Railway, and District of Squamish. Coordinating Committee members should be appointed on a term basis to encourage continuity in Committee deliberations. Chairmanship of the Coordinating Committee may rotate among the member agencies. The Implementation Coordinator, who will act as Secretary to the Coordinating Committee, will be the main contact person from the Committee. The Coordinating Committee will seek to function by consensus. Failing that, minority reports should be allowed in the event of rulings by simple majority of the Coordinating Committee membership.

The District of Squamish should undertake appropriate actions for consultation with public involvement residents or public interest groups. This would not limit other avenues of public access to the Coordinating Committee.

2.1.2 The Implementation Coordinator

The Implementation Coordinator will act as Secretary to the Coordinating Committee. The Coordinating Committee will approve the terms of reference of the Implementation Coordinator.

Those tasks associated with implementation that are of a technical or administrative nature will be the responsibility of the Implementation Coordinator. The Coordinator will work closely with the technical and advisory levels of government, the private sector and the public to provide technical support to the Coordinating Committee in initiating implementation actions.

The Coordinator will administer the procedures required to ensure the implementation of the Management Plan. Included within these procedures will be arrangements for conducting efficient and effective reviews of project proposals, coordinating project reviews with existing permitting requirements and referral systems, and distributing information on development proposals and research plans.

The Coordinator will review the completed prospectus for development proposals (see Section 3.1.4) and make recommendations to the Coordinating Committee regarding the need for further assessment of the proposals.

2.2 The Information Bank

The availability of information concerning the Squamish estuary and the Management Plan will be critical to successful participation by all parties involved in implementation. As called for in the terms of reference for the Squamish Estuary Management Plan, a public repository for information related to the Management Plan and its implementation will be established.

The public repository or Information Bank will include: the Management Plan and its component reports; reports and studies concerning the Squamish estuary and Howe Sound; lists of contacts in government, the private sector, and the public involved in Management Plan implementation; development proposals submitted for approval under the Plan; and a record of decisions.

As it will be updated with information obtained during implementation, the Information Bank will provide an opportunity to enhance ongoing public involvement. The Squamish Public Library has indicated a willingness to provide a location for the Information Bank. The Implementation Coordinator will cooperate with the Public Library in the operation of the Information Bank.

2.3 Amending the Management Plan

As additional information becomes available and decisions are made, the Management Plan may require amendment.

The Implementation Coordinator will coordinate the collection of information required to refine the Management Plan. Refinement may include amendments of area designations. The Coordinating Committee may identify work groups to analyze specific concerns within the estuary to enable decisions on revisions to be based on reliable information. Some proposed actions and studies are presented in Sections 4.0 and 5.0.

Proposed amendments to area designations and other major amendments to the plan should be reviewed by the public, the private sector and government. The extent of review of proposed amendments will be determined by the Coordinating Committee and will depend on the nature of the change involved. The recommendations of the Coordinating Committee regarding a proposal for a major change to the Management Plan, and appeal procedures, may be jointly reviewed at the discretion of the Canada Minister of Fisheries and Oceans and the British Columbia Minister of Environment. However, decisions regarding minor amendments to the Plan will be made by the Coordinating Committee.

The Coordinating Committee will prepare a review within 5 years to assess the progress of the Management Plan.

2.4 Environmental Impact Review

All regulatory agencies and representatives of project proponents would refer all proposals to the Coordinating Committee regardless of what other procedures may be followed, to enable the Coordinating Committee to determine its own course at an early stage.

The environmental impact review process to be applied in the Squamish estuary is designed to operate as a component of the overall management framework. Accordingly, emphasis will be placed on conformance with the intent of the Management Plan when determining the type and level of environmental review required for a proposal. If a proposal has been prepared with reference to the Policy Guidelines for Area Designation, it will necessarily be sensitive to the Management Plan's objectives regarding location, design and operation. Consequently, the extent of environmental review required will in most cases be significantly reduced. If the objectives of the plan have not been accommodated, or only partly accommodated in the proposal, or if adherence to the elements of the Management Plan will not ensure sufficient environmental protection, a more detailed analysis of the environmental implications of the project will be required.

The environmental impact review process should match the level of environmental review to the needs of each proposal. It should be noted that developments within the designated industrial/commercial areas are subject to review. However, it is expected that the Coordinating Committee will exercise discretion in its handling of proposals within these areas. The degree of scrutiny to which proposals are subjected should be in keeping with the locations, the degree to which the proposal conforms to the objective and policy for the designation, the degree of change expected to result from the proposal and the potential for adverse effects on other interests or other sites.

Implementation of the environmental impact review provisions of the Management Plan will be based on a two level approach. The requirement for ensuring that a project is reviewed by the Coordinating Committee will be enforced through appropriate existing legislation. It is expected that a regulatory agency will inform proponents applying for permits or approvals from the agency, if approval under the environmental impact review process will be required. The Coordinating Committee will make recommendations regarding terms and conditions for a proposed project to be incorporated into the appropriate approvals by regulatory agencies.

2.4.1 Prospectus Preparation

It is important for the Coordinating Committee to recognize when a project is subject to another administrative process (e.g., Energy Project Review Procedures), and refer the proponent to the appropriate authority before any prospectus is prepared. In this case, the Coordinating Committee

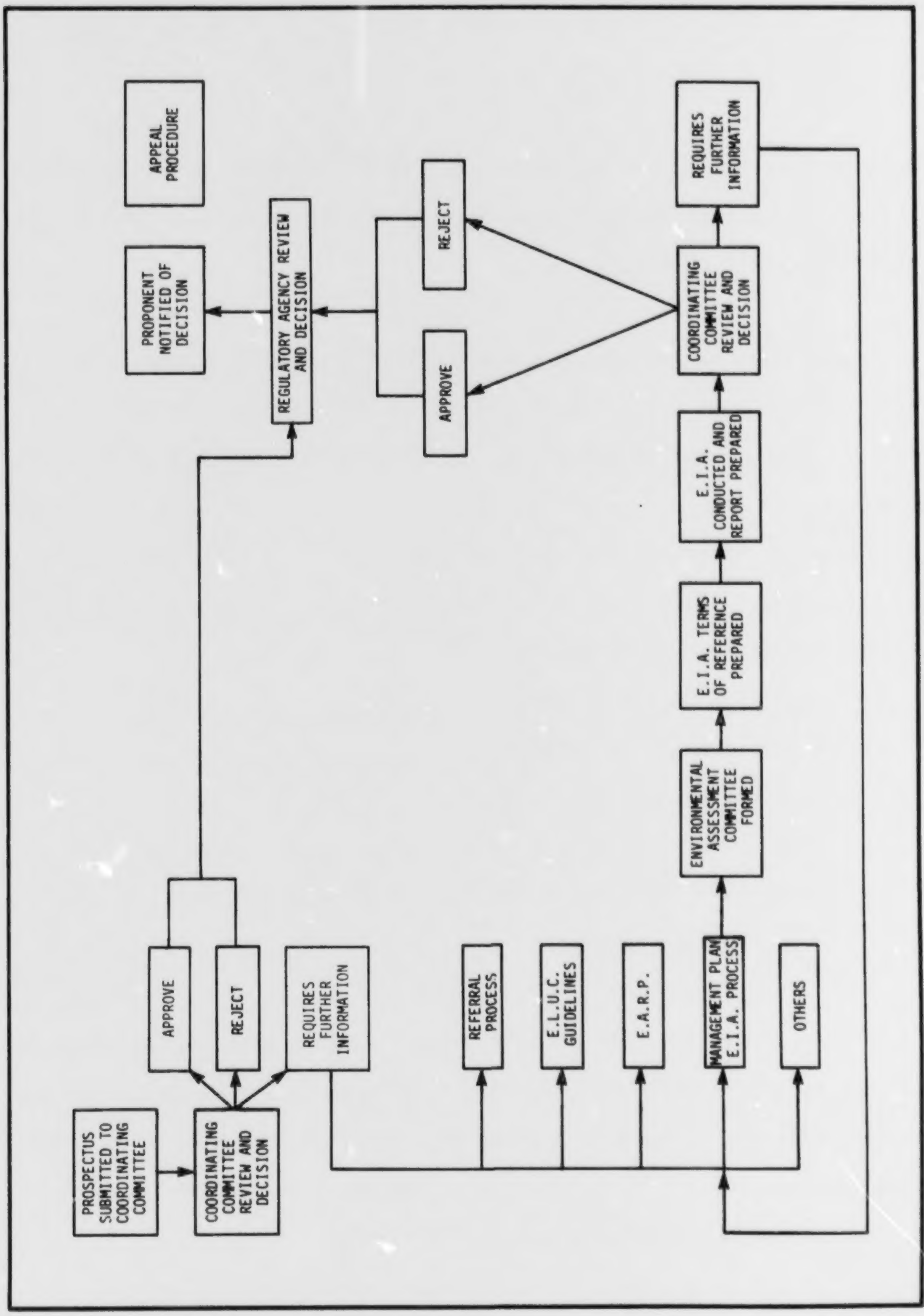
PROSPECTUS SUBMITTED TO COORDINATING COMMITTEE
COORDINATING COMMITTEE REVIEW AND DECISION
APPROVE
REJECT
REQUIRES FURTHER INFORMATION
REFERRAL PROCESS
E.L.U.C. GUIDELINES
E.A.R.P.
MANAGEMENT PLAN E.I.A. PROCESS
OTHERS
ENVIRONMENTAL ASSESSMENT COMMITTEE FORMED
E.I.A. TERMS OF REFERENCE PREPARED
E.I.A. CONDUCTED AND REPORT PREPARED
COORDINATING COMMITTEE REVIEW AND DECISION
APPROVE
REJECT
REQUIRES FURTHER INFORMATION
REGULATORY AGENCY REVIEW AND DECISION
PROPONENT NOTIFIED OF DECISION
APPEAL PROCEDURE

FIGURE 4 ENVIRONMENTAL REVIEW PROCESS

should be kept informed of any subsequent events relating to the responsibilities of the Coordinating Committee or which potentially affect the estuary management plan area.

Should there be no other process applicable, the key action in determining the required level of environmental assesesment will be the preparation of a prospectus document by the proponent. The purpose of the prospectus will be to provide the Coordinating Committee with sufficient information to determine what type of environmental impact assessment is required, if any. Accordingly, the prospectus should provide the following information regarding the proposal:

(i) rationale for the project;
(ii) description of the project;
(iii) location and design;
(iv) description of project's relationship to the Management Plan; and
(v) preliminary indication of the anticipated environmental consequences of the project.

The prospectus should be prepared in consultation with the Coordinating Committee to ensure that the appropriate information is being presented and that the proponent is aware of sources of information which would be useful in the preparation of the prospectus. The completed prospectus will be submitted to the Coordinating Committee for review.

On the basis of the review, the Coordinating Committee will recommend one of three courses of action regarding the proposal (see Figure 4):

(i) approval with conditions to ensure environmental concerns are taken into account; or

(ii) disallowance with justification; or

(iii) a specified course of action for further assessment of the proposal. This could include the acquisition of additional information such as that referred to in Section 5.0 and Appendix E.

2.4.2 Environmental Impact Assessment Process

If the existing environmental impact assessment procedures which are provided by other than the Management Plan do not apply, or referral systems cannot adequately assess the environmental implications of a proposal, the Management Plan's environmental impact assessment procedure will be applied (Figure 4). An Environmental Impact Assesesment (EIA) may involve the general assessment of alternatives regarding the design and location of the proposed activity. Following review of this information on alternatives, it may be necessary to conduct a site-specific EIA to determine the specific environmental implications of the preferred alternative for the project. In other cases, it may be possible to restrict the assessment to site-specific analysis.

An Environmental Assessment Committee will be formed by the Coordinating Committee and will consist of a chairman selected by the Coordinating

Committee from an appropriate government agency, and individuals from interest groups and agencies appropriate to represent the areas of expertise required to address the specific attributes of each proposal. During the preparation of the Environmental Impact Assessment, the Implementation Coordinator will be available to advise the proponent.

Preparation of the Environmental Impact Assessment will be the responsibility of the proponent. The Environmental Assessment Committee will prepare terms of reference for the assessment. In all cases, the emphasis of the terms of reference will be on the collection and analysis of the information which will lead to an adequate understanding of the environmental implications of the proposal.

2.4.3 Review of an Environmental Impact Assessment

Upon completion, the proponent will submit the Environmental Impact Assessment report to the Environmental Assessment Committee, who will review the report to ensure adherence to the terms of reference and prepare a report to the Coordinating Committee. Included within the report to the Coordinating Committee will be a substantiated recommendation for approval, rejection or specified additional assessment of the proposal.

The Coordinating Committee may supplement the information provided by the Environmental Assessment Committee by involving the public in the environmental review process. The public will have an opportunity to provide written comments to the Coordinating Committee during the proposed review period. In addition, the Coordinating Committee may convene public meetings to facilitate review of a proposal.

A final decision concerning a proposed use of the estuary should consider the overall benefit to be derived from the proposal. Therefore, the Coordinating Committee may supplement the information obtained in the environmental review by requiring the proposal to be subjected to benefit-cost analysis or other appropriate studies.

2.4.4 Outcome of an Environmental Impact Assessment

Upon review of the Environmental Assessment Committee report, input which the public may have presented and the benefit-cost analyses or other analyses which may have been conducted, the Coordinating Committee will make recommendations regarding the proposal to the appropriate regulatory agencies. If the decision will require a major amendment to the Management Plan, such as a change in an area designation, the recommendations of the Coordinating Committee would be forwarded to the Ministers for ratification prior to release. If the decision is largely administrative in nature and will not require a major change to the Management Plan, the recommendations of the Coordinating Committee would be forwarded to the regulatory agencies in writing and a copy would be sent to the proponents. The report to the regulatory agencies and the proponent will indicate special considerations recommended as conditions of approval, the specific additional information requirements needed to evaluate the proposal further, or the rationale for rejection.

It is intended that terms and conditions for approval of a proposed project will be incorporated into the permits or approvals required by relevant government regulatory agencies.

Part III Guidelines for Management

PART III: GUIDELINES FOR MANAGEMENT

3.0 POLICY GUIDELINES AND AREA DESIGNATION

3.1 Policy Guidelines

As noted in Section 1.0, there are a large number of agencies with varying roles and responsibilities involved in the management of the Squamish estuary. Under the existing management approach, the policies and practices of most of these agencies are oriented towards meeting their respective mandates. This approach tends to limit or overlook opportunities for agency cooperation and often results in disagreement regarding the most appropriate use of the estuary. In order to provide a basis for the resolution of conflicting management approaches, a general set of policy guidelines has been prepared. Their purpose is to provide agencies with a set of guidelines which reflect the overall intent of the Managment Plan.

Commitment to these guidelines will be essential to obtain the cooperation of those interests involved in the occupation and development of land. This sector of the community has an important role to play in translating the Management Plan into actions and results and must develop a commitment to fulfilling this role. Each landowner and/or developer should adhere to sound environmental construction, design and operational principles.

In the absence of the information required to make decisions with certainty, it is often necessary to rely upon principles derived from existing knowledge and theory. Many of the future decisions on the use of the Squamish estuary will have to be made on this basis. The principles embodied in the guidelines are intended to aid in the selection of proper choices until the information required for more confident decision-making is available. Although the guidelines are primarily intended for new activities, because adherence will aid in receiving required project approvals, existing activities should also strive to incorporate them whenever practicable.

In order to incorporate the guidelines into the existing decision-making framework, those agencies with responsibility in the estuary should seek to adjust their practices and procedures to conform to the intent of the Guidelines. This adjustment may most appropriately be conducted as part of an overall review of an agency's policies regarding the estuary in light of the entire Management Plan document. The guidelines are intended to complement, and do not supercede existing statutes, regulations and guidelines.

It is important to realize that the guidelines are just guidelines. Given a particular circumstance, not all of them will necessarily be applicable. Although the goal of some of the guidelines is to reduce the adverse environmental impact of an activity to the greatest possible extent, it is recognized that in principle all impact reduction actions must be socio-economically cost effective as well as environmentally acceptable. As an example, the Province has recently introduced "Environmental and Social Impact Compensation/Mitigation Guidelines" which explain the applications of this principle.

3.1.1 Planning and Decision-Making

Planning by individual government agencies and private corporations should be conducted within the context of the Squamish Estuary Management Plan. Activities and projects should be designed and constructed to mitigate sedimentation rates and patterns; adverse effects on water and air quality; important fish and wildlife habitats; land and water transportation routes; public services and facilities and existing land uses, as explained in the Provincial Compensation/Mitigation Guidelines mentioned above.

Planning and decision-making should take into account the physical and biological characteristics of the estuary, existing land uses and modifications, long-term and short-term demands and market conditions, and the economic, social and environmental impacts of decisions. In the event of a conflict, involved parties should assess a range of alternative means of adjusting their respective goals, policies and practices toward satisfactory resolution of the conflict.

3.1.2 Industrial Sites

Sites possessing immediate access to the waterfront should be used by those types of industry which require water access. For the purposes of the Management Plan such types of industry are defined as being water-dependent. Industries not requiring port facilities on a regular basis should locate at a site away from the estuary, with provision made for access to port facilities.

Lease tenures for industrial facilities should be made on a basis which encourages appropriate investment for optimal use of the site.

3.1.3 Development of Land and Water Uses

Development projects shall avoid or mitigate adverse impacts upon adjacent resource values and land or water uses. Consistent guidelines such as the provincial "Environment and Social Impact Compensation/Mitigation Guidelines" involving provincial resources are suggested.

Planning for developments should consider compatible multiple use.

Use of land now supporting industrial commercial activity should be maximized before developing new sites in order to conserve the limited supply of developable land.

Industrial/commercial facilities should be designed to make the most efficient use of shore areas. Multi-purpose and cooperative use of moorage, parking, cargo handling and storage facilities should be undertaken where feasible. When new facilities are proposed, the applicant should show that the use of existing facilities in the area would not be possible or would not be desirable.

All developments on flood-prone lands should be designed to be flood-proof and to avoid causing flood or erosion damage at other locations.

Land-water access should be planned to minimize traffic congestion and to minimize pedestrian/vehicle conflicts.

Loading and unloading facilities should be designed to reduce the accidental or incidental discharge of the material being handled into the air or water. Facilities to treat and dispose of waste water, to prevent and clean up spills, and to dispose of toxic materials or petroleum products must be provided where warranted. This should include any ship wastes (domestic or industrial) or bilge water which may in future be discharged from visiting ships.

Where potential exists for contamination of surface or subsurface water with toxic chemicals, oil and grease or fuel, appropriate collection and treatment facilities must be provided.

Visible air emissions and toxic chemicals in emissions to air or in liquid effluent must be minimized, in accordance with prevailing pollution control objectives.

3.1.4 Habitat Protection and Development

The area under Conservation designation may be increased in size through transfer from Planning Assessment designation after the required investigations and reviews have been completed.

All technically and economically feasible measures to improve the biological productivity of existing habitat areas under Conservation designation should be implemented as circumstances permit, in order to compensate for past and future losses and to make best possible use of the Conservation areas.

The level of environmental management afforded to an area designated for conservation should correspond to that area's sensitivity to disturbance, or to its potential for cost effective enhancement or development, in order to make most beneficial use of resources available for environmental management. Full and consistent enforcement of all legislation and regulations pertaining to the protection of habitat and natural areas should be applied.

A proposal for restoration or resource enhancement should be accompanied by an analysis of possible adverse effects on such factors as circulation and current patterns, shoaling or erosion, water quality, and habitat and natural resource values. Proposals should be designed and planned to avoid adverse effects.

3.1.5 Log Handling and Processing Facilities

Logs being transported or stored on water should be bundled where sites permit, to reduce problems of bark and debris loss and sunken logs, and all logs should be securely retained within booming and handling areas. Dryland sorting and storage of logs is preferred to water-based sorting and storage, particularly over intertidal areas, in order to minimize interference with other water uses and potential degradation of water quality and habitat.

Water-based log storage should be located where tidal or current flushing action is adequate to disperse polluting wastes. Logs should only be dumped, boomed or stored where depths are sufficient to prevent grounding.

Water-based or dryland log storage operations should provide:

(i) easy let-down devices for placing logs in water;

(ii) positive bark and wood debris controls and disposal means at log dumps, booming areas, and millside handling areas;

(iii) means to control, collect and discharge surface runoff in a manner which ensures protection for the quality of adjacent waters.

3.1.6 Dredging and Disposal of Dredged Material

Dredging in the estuary should be considered only:

(i) for navigation or navigational access; or

(ii) in conjunction with a permitted water-dependent use; or

(iii) as part of an approved rehabilitation project.

When dredging is permitted, it should be the minimum necessary to accomplish the proposed use and to prevent frequent maintenance dredging. The timing of dredging and disposal should be coordinated with provincial and federal resource agencies to ensure adequate protection of biological productivity.

Erosion, sedimentation, increased flood hazard over the base-line condition to which flood zoning is set and changes in surface water flow patterns should be minimized both during and after dredging operations.

Adverse short-term effects of dredging and disposal such as increased turbidity, excessive release of nutrients, heavy metals, organic material or toxic substances, dissolved oxygen depletion, disruption of the food chain, loss of benthic productivity and disturbance of fish runs and important local biological communities should be minimized. Dredging of highly anoxic or contaminated sediments should not be considered unless acceptable procedures are developed and can be used to eliminate potentially adverse effects.

Dredging should employ techniques that minimize the dispersal and broadcast of bottom material.

For disposal of dredged material in the river or estuary:

(i) Consideration should be given to the need for disposal and to the availability and desirability of alternative sites and methods of disposal that might be less damaging to the environment. No intertidal/marine site should be used when the impact of disposal on the biophysical features of the site will be significant.

(ii) The particle size characteristics of the dredged material should be compared with those of the disposal site, and consideration should be given to matching the dredged material to the characteristics of the receiving site, to assure stability of the placed material.

For disposal of dredged material on land:

(i) Proper diversion of surface discharge should be provided to maintain the integrity of watercourses, intertidal areas and drainageways. Leaching of disposal runoff into the waterway must be controlled and all disposal runoff water must enter the waterway through an outfall at a location which maximizes assimilation.

(ii) Disposal should be compatible with the intended land use after disposal and should occur on the smallest possible land area.

(iii) Where appropriate, revegetation of disposal sites should occur as soon as possible in order to reduce the potential of erosion and to restore the habitat value of the site.

(iv) The final height and slope after each use of a dredged material disposal site should be such that:

a) the site does not enlarge itself by sloughing and erosion.

b) the potential for loss of material from the site during storms and freshets is minimized.

c) interference with the view from nearby residences, scenic viewpoints or recreational sites is minimized.

The use or recycling of dredge spoil for shore or habitat enhancement should be considered as an alternative to landfill or open water disposal.

Infill should be considered only:

(i) upon completion of a thorough examination of alternative location and/or methods of construction; and

(ii) in conjunction with a permitted water-dependent use; or

(iii) as part of an approved rehabilitation project.

Infills should be located and designed with due consideration of potentially adverse impacts on flooding, erosion, navigation, estuarine habitat, processes and functions, water circulation and sedimentation patterns, water quality and recreational activities.

3.1.7 Research

The Planning Committee recognizes that research studies could contribute to better decision-making in various aspects of the management of the Squamish estuary, and invited the technical work groups to recommend on this subject. In response, recommendations were made to the Planning Committee in regard to air and water quality, land and water use, recreation and fish and wildlife habitat. These research proposals, contained in Appendix E (Volume Two) of this report, have not been priorized. Early attention should be given to priorization of research proposals in the implementation of the Management Plan. Emphasis should be placed on providing solutions to the most significant management problems.

3.1.8 Recreation

Recreational opportunities should be preserved, enhanced and, where possible, their variety as well as quantity should be expanded. Improving access to, and awareness of, recreational opportunities should be encouraged.

Recreation opportunities should be planned in cooperation with the landowners to avoid potentially adverse impacts on the quality of estuarine habitats, to avoid the disturbance of wildlife, to promote public safety, and to respect the rights of the landowners.

Recreational developments should be located, designed, constructed and managed to preserve natural features which are scarce or valuable to the estuary. They also should facilitate appropriate human use of such features. The type and concentration of recreational development of an area should be dictated by both its physical limitations and opportunities. Such conditions as soil characteristics, slopes, geological features, surface and sub-surface drainage, water tables, shore form and native plant and animal life should be taken into consideration when planning recreational development of an area.

Improved education of the public regarding natural systems and man's involvement in estuaries is important to estuarine management. Many opportunities exist in recreational development for effective interpretation of estuarine habitats through nature trails and signs. Such interpretive measures should be encouraged in a manner consistent with proprietary interests.

3.2 Area Designations

The diverse resource base of the Squamish estuary provides a wide range of opportunities for an equally wide range of activities. Due to the present land and water use patterns and the perceived potential of undeveloped areas within the estuary for specific types of use and activities, there is an evolving pattern of land and water use preference. However, not all of the activities which have historically occurred within the estuary can co-exist compatibly. Some activities, particularly those associated with resource conservation, require specific needs and conditions which cannot be met if adjacent uses or activities are incompatible. In contrast to this lack of compatibility, other activities, particularly in the industrial/commercial sector, derive distinct advantages from being located adjacent to similar or related activities.

The approach which has been adopted within the Management Plan to recognize these compatibilities and incompatibilities has been to designate areas for specific types of best use. The three designations which have been applied are Conservation, Industrial/Commercial and Planning Assessment (the latter was called "Unclassified" in the terms of reference). No tracts have been identified within the planning area that are suitable for designation in the fourth and fifth categories, Preservation and Mixed-Use. Each of these designations has a specific role to play in the provision of suitable sites for various activities, and each has a set of policies which refine and supplement the Management Policy Guidelines. These policies are intended to assist government agencies in making decisions which conform to the objectives of the Management Plan and to provide potential developers with an insight regarding the management objectives for each designation.

It must be emphasized that area designations are intended to be flexible in the long-term so that the future requirements of society can be met. Area designations are intended to be advisory to authorities over land uses.

3.2.1 Conservation Areas

3.2.1.1 Objective

Many areas within the estuary have been identified as possessing estuarine habitats which are integral to the continued existence of the estuary as a productive biophysical entity. The Conservation designation is intended to ensure that these portions of the estuary are managed so that their contribution to the overall estuarine community will be maintained and where appropriate, restored or enhanced. Included within this objective will be the development of compatible educational and recreational opportunities.

3.2.1.2 Policies

The attainment of the objective outlined above will be facilitated by the following policy guidelines.

1. Only those activities which will not hinder the achievement of the conservation objectives should be allowed.
2. The location and design of activities involving modification to the estuary will be subject to the Environmental Impact Assessment process, described in Chapter 2.
3. Activities in locations adjacent to conservation areas will be reviewed to ensure that the integrity of the Conservation area is not compromised.
4. Public appreciation and understanding should be promoted through the Information Bank and other appropriate means.

3.2.2 Industrial/Commercial Areas

3.2.2.1 Objective

Historically, a number of areas within the estuary have emerged as preferred locations for industrial or commercial activities and urban development. These sites possess a number of locational advantages including ready access to land- and water-based transportation. The purpose of the Industrial/Commercial designation is to provide security to these interests through the long-term provision of sites, while at the same time encouraging the maximum utilization of presently developed areas before other portions of the estuary are developed for Industrial/Commercial purposes.

3.2.2.2 Policies

1. Methods to increase the utilization and efficiency of land within the Industrial/Commercial designation should be strongly encouraged as an alternative to development of other sites within the estuary. Increasing the period of tenure for these sites should be considered as an incentive to promote their long-term efficient use.
2. Activities which are water dependent should be strongly preferred to those which do not require ready and frequent access to water. Non-water dependent activities should be located outside the estuary.
3. The policy guidelines cited earlier in Section 3.1 should be adhered to in the design and operation of all activities.

3.2.3 Planning Assessment Areas

3.2.2.1 Objective

Throughout the planning process, numerous deficiencies in the data and information base for the Squamish estuary were identified. In some cases the nature of these deficiencies, including a lack of biophysical and economic suitability information, was serious enough to prevent a rational determination of the most appropriate use for a specific area. In other cases, uncertainty regarding the most appropriate designation was created by the presence of information which indicated that a given area possessed significant value for both conservation and industrial/commercial purposes.

One implied requirement of this designation is to determine the type of assessment required to eliminate the present uncertainty regarding the most appropriate use. Detailed analysis of appropriate biophysical and economic information may eventually allow each Planning Assessment Area, or portion thereof, to be placed confidently into either Conservation or Industrial/-Commercial designation. It should be noted that redesignation of Planning Assessment areas is not an urgent matter unless specific proposals require the land to be in another designation. This designation preserves all other future options.

One of the methods to focus the collection of information required for redesignation will be the economic and environmental analysis of specific proposals. Accordingly, the areas within this designation will be considered as potential sites for Industrial/Commercial or Conservation use. Applications will be reviewed under the Environmental Impact Assessment process described in Part II. In addition, the Coordinating Committee (Part II) may direct that appropriate studies be undertaken to evaluate the economic feasibility and benefit/cost relationships of proposals.

Once the studies have been completed, the Coordinating Committee will be responsible for reviewing the information and making a decision regarding the proposal. If the proposal is accepted, the designation will be redefined accordingly. If the proposal is rejected, the Coordinating Committee will ordinarily leave the site within the Planning Assessment designation.

Until the project or site-specific investigations are complete, the environmental controls over activities(1) in Planning Assessment areas should be the same as for Conservation areas. Thus, the present character of the areas within this designation would be maintained.

3.2.3.2 Policies

1. The existing character of areas within this designation will be maintained.

---

[1] There is a long-standing log dumping operation in Planning Assessment area 1 to which this statement is not intended to apply.

2. All proposals for development or conservation activities will be subject to the Environmental Impact Assessment process and those economic feasibility and benefit/cost analyses required by the Coordinating Committee.
3. Those studies which will aid in providing the information required to assess better the use potential of these areas should be conducted.

3.2.4 Assignment of Designations

The recommended designations of certain areas in the estuary are shown in Figure 5. The rationale and specific management recommendations are included as Appendix F. The process by which the designations were assigned was as follows. Consensus agreement by the Planning Committee was required before an area would be placed in either the Conservation or Industrial/-Commercial designation. If agreement could not be reached, or if necessary information was lacking, the area in question was placed in the Planning Assessment designation. The present designations are primarily a recognition of existing resource and industrial values within the estuary.

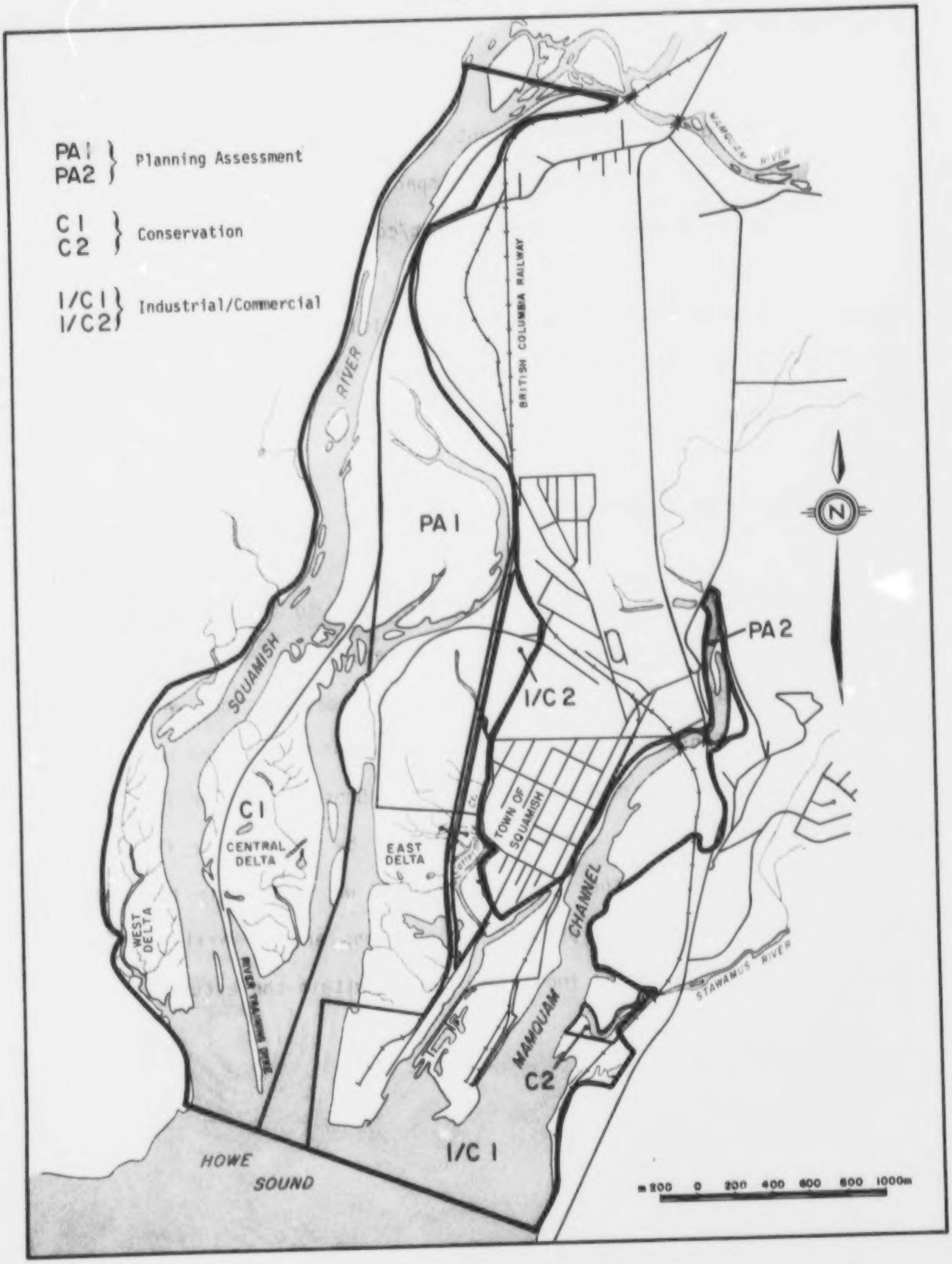
PA1
PA2
Planning Assessment
C1
C2
Conservation
I/C1
I/C2
Industrial/Commercial
MAMQUAM RIVER
BRITISH COLUMBIA RAILWAY
SQUAMISH RIVER
PA 1
PA 2
I/C 2
TOWN OF SQUAMISH
C1
CENTRAL DELTA
EAST DELTA
WEST DELTA
RIVER TRAINING DYKE
MAMQUAM CHANNEL
STAWAMUS RIVER
C2
I/C 1
HOWE SOUND
N
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FIGURE 5 AREA DESIGNATIONS

4.0 ENVIRONMENTAL PROTECTION, HABITAT IMPROVEMENT, RECREATIONAL DEVELOPMENT AND INDUSTRIAL PROPOSALS

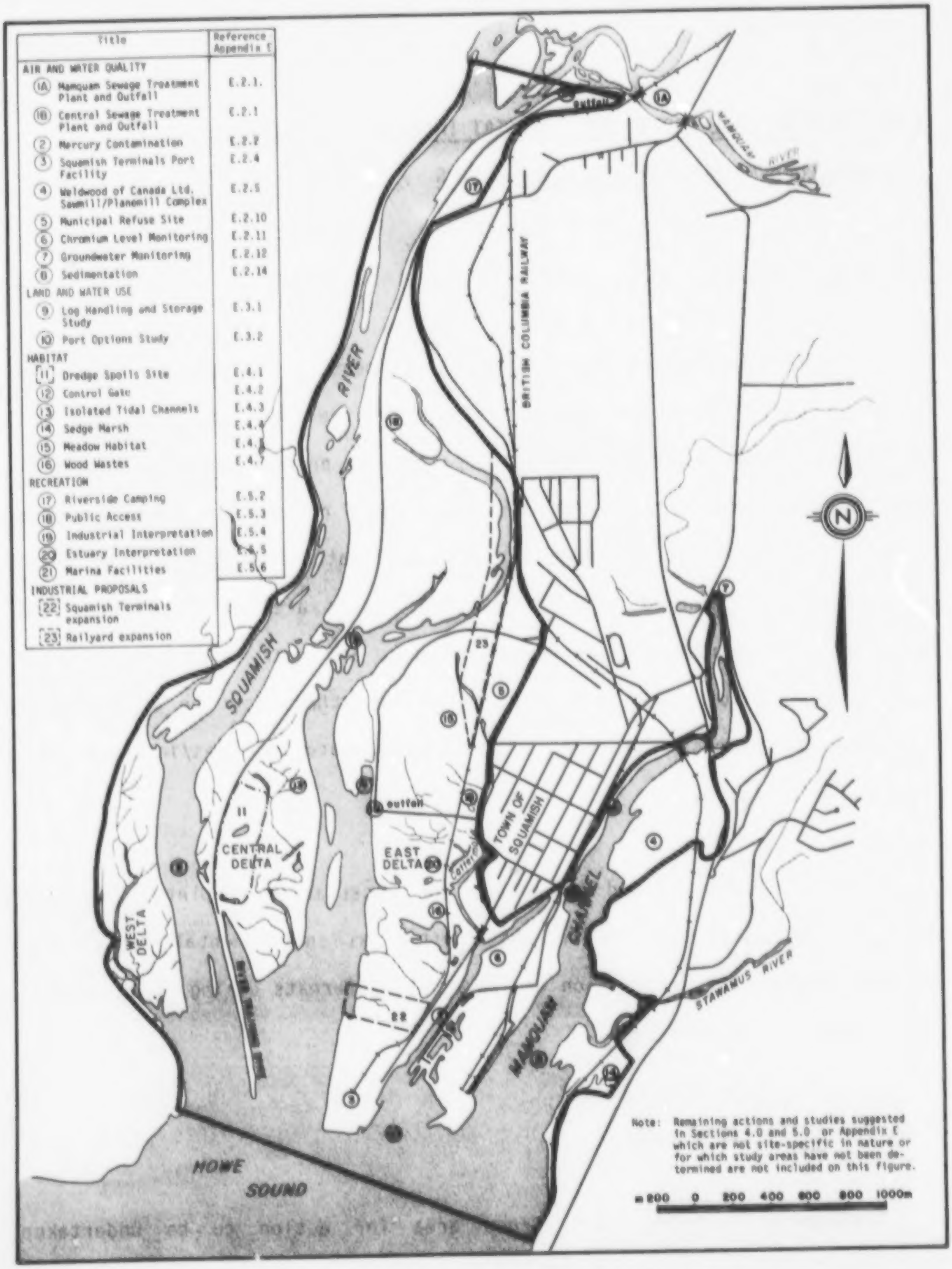
4.1 Introduction

This Section details proposals which are meant to improve the condition of the estuary. The proposals are listed under the four topic areas covered by the Work Group reports, although a particular proposal may not have been made by that Work Group. Further details and rationale related to each proposal are provided in Appendix E. The locations of some subjects of discussion are shown in Figure 6. The proposals are not priorized. The cost of their implementation is approximate, and must be determined more accurately. Costing and priorizing would be matters for the Coordinating Committee to address and refer to the appropriate agencies/interests for consideration/action.

The proposals oulined below are not necessarily complete. Further specific proposals may be brought forth from environmental protection, habitat improvement, recreation or industrial interests during or subsequent to the public review process.

4.2 Air and Water Quality

Proposals for this Work Group area for action to be undertaken included:


SQUAMISH RIVER
MAMQUAM RIVER
STAWAMUS RIVER
MAMQUAM CHANNEL
HOWE SOUND
WEST DELTA
CENTRAL DELTA
EAST DELTA
TOWN OF SQUAMISH
BRITISH COLUMBIA RAILWAY
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800
1000m

Title	Reference Appendix E
AIR AND WATER QUALITY	
(1A) Mamquam Sewage Treatment Plant and Outfall	E.2.1.
(1B) Central Sewage Treatment Plant and Outfall	E.2.1
② Mercury Contamination	E.2.2
③ Squamish Terminals Port Facility	E.2.4
④ Weldwood of Canada Ltd. Sawmill/Planemill Complex	E.2.5
⑤ Municipal Refuse Site	E.2.10
⑥ Chromium Level Monitoring	E.2.11
⑦ Groundwater Monitoring	E.2.12
⑧ Sedimentation	E.2.14
LAND AND WATER USE	
⑨ Log Handling and Storage Study	E.3.1
⑩ Port Options Study	E.3.2
HABITAT	
[11] Dredge Spoils Site	E.4.1
⑫ Control Gate	E.4.2
⑬ Isolated Tidal Channels	E.4.3
⑭ Sedge Marsh	E.4.4
⑮ Meadow Habitat	E.4.5
⑯ Wood Wastes	E.4.7
RECREATION	
⑰ Riverside Camping	E.5.2
⑱ Public Access	E.5.3
⑲ Industrial Interpretation	E.5.4
⑳ Estuary Interpretation	E.5.5
㉑ Marina Facilities	E.5.6
INDUSTRIAL PROPOSALS	
[22] Squamish Terminals expansion	
[23] Railyard expansion	

Note: Remaining actions and studies suggested in Sections 4.0 and 5.0 or Appendix E which are not site-specific in nature or for which study areas have not been determined are not included on this figure.

FIGURE 6 PROPOSED ACTIONS AND STUDIES

1. Flow equalization facilities should be considered at both the Mamquam STP and the Central STP to improve effluent quality. Any engineering study undertaken in this regard should also evaluate the present flow metering equipment (see E.2.1 i).

2. The effluent discharge point from the Mamquam STP should be modified so that discharges occur from a submerged outfall in the Squamish River (see E.2.1 ii).

3. Samples collected by the District of Squamish for bacteriological analyses should be taken utilizing proper sampling techniques for chlorinated samples (see E.2.1 v).

4. All decisions related to dredging, dumping, or re-exposing mercury contaminated sediments must be given careful site-specific consideration. Approved dredging and dumping operations should be appropriately monitored (see E.2.2, Part II a).

5. FMC of Canada should complete the filling and capping of the abandoned settling pond, continue efforts to reduce mercury losses while determining remaining unaccounted-for mercury losses (see E.2.2, Part II 6).

6. The Woodfibre Pulpmill should take the necessary steps to meet the limits of its pollution control permit for air emissions in order to reduce the odour problem in Squamish (see E.2.3).

7. Squamish Terminals should improve the recovery of their waste oil, take steps to reduce levels of pentachlorophenol and associated substances being released into the estuary, and make periodic inspections of the intertidal zone influenced by the exfiltrate from the rock seepage pit (see E.2.4 and E.2.13).

8. Weldwood of Canada Ltd. should take steps to reduce levels of pentachlorophenol and associated substances being released into the estuary, and should investigate methods to reduce the spillage of wood chips during the loading of barges (see E.2.5).

9. Any proposed developments should be fully investigated to ensure adequate freshwater supplies be maintained for present users.

10. Continuous discharges of wastes having high oxygen demand should not be allowed to waters at great depth, north of the sill of Howe Sound.

11. Proposed discharges of alkaline or acidic wastes into riverine water should be made through submerged outfalls. Areas of the estuary with low salinity or with poor water exchange, should not receive alkaline wastes.

4.3 Land and Water Use

Proposals put forth from this Work Group area dealt entirely with information gathering to improve the basis for future decisions. As such, these proposals are summarized in Section 5.3.

4.4 Habitat

1. Tidal channels which have been isolated from the remainder of the estuary should be reconnected to Howe Sound to improve the potential for use of these channels by fish and waterfowl (see E.4.3).

4.5 Recreation

1. The construction of a campground near the Squamish Mamquam confluence should be considered to improve public access to the estuary for recreational use (see E.5.2). Special care and consideration should be given to the implications of the proximity of this site to the sewage treatment plant outfall.

2. To provide better public access, three sites should be constructed which include facilities for parking, toilets, garbage receptacles, and information signs (see E.5.3).

3. Industrial and estuary interpretation themes should be considered to enhance public knowledge. Logging history, and an estuary interpretive centre and trail system may be considered alternatives (see E.5.4 and E.5.5).

4.6 Industrial

There are two industrial development proposals known to the Planning Committee at the time of writing, for which the Planning Committee could not resolve the necessary area designation issues. Therefore these two proposals are delineated in Figure 6 and the nature of the proposals are summarized below.

1. Squamish Terminals Ltd., who have a 40.5 hectare (100 acres) industrial lease, propose to develop their entire port facility site to accomodate growing transhipment of export commodities. This would involve infilling on the remaining 13.0 hectares (32 acres) adjacent to the north side of their present development.

2. British Columbia Railway Company anticipates a need for expansion of their marshalling yards to accommodate growing traffic from the interior and the foreseen relocation of certain of its North Vancouver yard operations. This expansion is proposed to be located within company-owned land south of the present railyard on the west side of the existing track to Squamish Terminals and north from Pemberton Ave.

5.0 STUDIES RECOMMENDED TO THE PLANNING COMMITTEE FOR IMPROVED DECISION-MAKING

5.1 Introduction

This section details recommendations by technical Work Groups to the Planning Committee which are meant to improve the basis for future decisions. As such, the recommendations are oriented towards information gathering and research. The recommendations are listed under the four topic areas covered by the Work Group reports, although that particular recommendation may not have been made by that Work Group. Further details and related rationale are provided in Appendix E. The recommendations are not priorized. The cost of their implementation is approximate, and must be determined more accurately. The Coordinating Committee would address this along with the priorities of various research proposals. Some of the studies would be appropriately carried out by proponents of developments which require resolution of particular questions, before decisions are made respecting the proponent's development proposal.

5.2 Air and Water Quality

Recommendations submitted include:

1. Studies should be conducted at the effluent discharge points from the Mamquam STP and the Central STP to assess the effect of the sewage

effluent on ammonia values under "worst case" conditions in the estuary (see E.2.1 iii).

2. The need for year-round chlorination and the possible requirement for dechlorination at those times when the sewage treatment plant effluents are being chlorinated should be investigated (see E.2.1 iv).

3. Further study should be undertaken to determine what steps are appropriate to prevent deleterious effects from mercury-contaminated sediments in the Cattermole Creek area. The study would assess options such as ocean dumping, landfilling, or covering the affected sediments. In the case of the two former options, effective measures for eliminating or minimizing siltation and dispersal of sediments should be investigated (see E.2.2, Part I).

4. FMC of Canada should continue to monitor groundwater wells adjacent to its abandoned settling pond three times per year (see E.2.2, Part II, b ii).

5. A study of temperature inversions, winds, and air quality in the areas of Howe Sound designated for industrial use, as well as a study of the degree and sources of air pollutants causing the haze problem, should be done (see E.2.6).

6. There should be a complete review of the nature and quantity of chemicals shipped into and out of the study area (see E.2.7).

7. There should be a systematic water sampling program of rivers, particularly in relation to low flow conditions (see E.2.8).

8. Further testing for trace organics contaminants in discharges is recommended (see E.2.9).

9. Leachates generated from the closed District of Squamish municipal refuse site should be sampled to determine their toxicity and zone of influence. The potential for methane generation from the site should be assessed if a development is proposed for the site or on adjacent lands (see E.2.10).

10. Leachate from the CanadianOxy brine sludge landfill may have caused elevated chromium levels in adjacent ditch water; this is a situation which should be monitored (see E.2.11).

11. Groundwater conditions adjacent to the Weldwood Empire Lumber solid waste disposal site should be monitored to determine the impact of leachate from the site (see E.2.12).

12. Monitoring should continue on the sedimentation processes in the vicinity of the migrating river bend and the Squamish River delta (see E.2.14).

5.3 Land and Water Use

The studies herein listed as 1 and 2 should be conducted, and the results implemented as soon as possible, since the majority of Crown foreshore leases for log handling will be due for renewal between 1982 and 1984.

1. A study should be done to recommend alternative means of handling and storing logs in the estuary (see E.3.1).
2. Methods to reduce or eliminate the impact of wood debris from the C.R.B. Logging Company Limited should be evaluated (see E.3.1, part II).
3. A port options study should be undertaken to assess the potential for additional transhipment and berthing facilities in the Squamish area (see E.3.2).

5.4 Habitat

The following studies may be conducted either by government agencies or by proponents through consultants:

1. An environmental and engineering study is needed to determine the feasibility of restoring the dredge spoil site in the Central Delta to a biologically productive state (see E.4.1).

2. The benefits which could be derived from installation of water control structures and/or additional culverts through the training wall to provide greater flow of fresh water into the Central Delta should be assessed (see E.4.2, Part I).

3. Annual summer surveys of marsh vegetation are recommended to determine any changes in the *Carex lyngbyei* distribution (see E.4.2, Part II).

4. A feasibility study is needed to determine if the sedge marsh east from the B.C. Railway mainline at the southeast side of Mamquam Channel should be reconnected to Howe Sound (see E.4.4).

5. A feasibility study is needed to determine whether the meadow in the East Delta, between the B.C. Railway line and the western edge of the town centre of Squamish, should be reconnected to the Central Basin or should be managed as a brackish impoundment (see E.4.6).

6. A feasibility study is recommended to determine if eelgrass could be re-established in the estuary (see E.4.6).

7. A study is recommended to assess whether the accumulated logs and other wood debris on the west side of the railway in the East Delta should be removed (see E.4.7).

8. A feasibility study is recommended to determine whether nesting enhancement should be undertaken (see E.4.8).

9. The habitat zone boundaries and the accuracy of classifications of the Habitat Classification Map should be verified and refined (see E.4.9, Part I).

10. An annual field survey should be conducted to record any changes to the habitat base (see E.4.9, Part II).

11. The comparative primary productivity of areas within the estuary should be assessed, with consideration of the relative value of the primary productivity to valued biological resources (see E.4.10).

12. A study to fill data gaps regarding invertebrates is recommended (see E.4.11, Part I).

13. Information should be obtained on generation time and longevity of Eogammarus confervicolus (see E.4.11, Part II).

14. A fish sampling study should be done to gain further understanding of fish biology and habitat relationships (see E.4.12).

15. A wildlife data collection study is required to gain further understanding of wildlife biology and habitat relationships (see E.4.13).

16. A synoptic oceanographic study should be carried out during all periods of high and low flow (see E.4.14).

5.5 Recreation

1. A study should be conducted to examine the current and expected demand for moorage, as well as options for moorage (see E.5.6).

Glossary

GLOSSARY

area designations:

Classifications which provide guidance regarding the type of use which could be permitted in a specific area and the conditions upon which approval of these activities would be based.

area-specific:

That which pertains to a particular or defined area.

biophysical:

The combined biological and physical characteristics or functions of a resource or area.

compensation:

Payments (in cash or in kind) which are made by the developer (or party responsible for the impacts) with the objective of redressing or offsetting the losses which occur despite or in lieu of mitigation efforts.

conserve:

The act of using a resource in a manner which avoids wasteful or destructive uses and provides for future availability.

conservation:

Planned management of a resource to prevent over-consumption, destruction, or neglect.

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delta:

The low, nearly flat, alluvial tract of land deposited at or near the mouth of a river, commonly forming a triangular or fan-shaped plain of considerable size, enclosed and crossed by many tributaries of the main river, perhaps extending beyond the general trend of the coast, and resulting from the accumulation (in a wider body of water) of sediment supplied by the river in such quantities that it is not removed by tides, waves, or currents.

dredging:

Excavation and removal of earth from the bottom of a body of water by mechanical means, usually for the purpose of deepening a navigational channel or obtaining bottom materials.

dredged material:

Material removed from land submerged by water through use of a dredge. Also known as dredgate.

dredged material disposal:

Disposal of dredged material on land, in the water or at sea.

ecosystem:

The living and non-living components of the environment which interact or function together, including plant and animal organisms, the physical environment, and the energy systems in which they exist.

eelgrass:

A submerged marine vascular plant that has long narrow leaves, produces seeds and generally grows on sand or mud bottom sediments (substrates) in the lower intertidal and upper subtidal zones.

effluent(s):

Waste materials, usually in a fluid state, discharged from a source generating the waste to a disposal area (e.g. sewage effluent).

environmental impact assessment:

The analytical process by which the effects of an intended activity expected to have significant environmental consequences are identified and assessed; usually involving the undertaking of specific studies and preparation of a detailed report.

environmental impact statement:

The documentation of an Environmental Impact Assessment.

environmental management:

The process by which the environmental resources of an area are identified and their use is planned and allocated by following a defined method.

environmental sensitivity:

The degree to which an environment or component thereof is affected by foreign influences.

estuary:

An area of mixing of freshwater and seawater, as at the mouth of a river or stream, often in conjunction with the existence of a delta.

fill:

Material such as sand, soil, gravel, rock or other solid material placed to produce a raised or level surface from a slope or depression.

foreshore:

With respect to land use in British Columbia, the land between the mean high water mark and mean low water mark.

habitat:

An area where a plant or animal naturally lives and grows.

habitat enhancement:

To improve the biological productivity or type of productivity of a habitat or natural resource.

infill:

Material such as sand, soil, gravel, rock or other solid material placed in a wetted area to create a beach or unwetted area by raising the surface above the water level.

intertidal zone:

The area of a marine shore bounded by the levels of high and low tide.

in-water (dredgate) disposal:

The disposal of dredged material in the estuary, river or ocean.

land (dredgate) disposal:

Dumping dredged material upon upland areas or upon areas which have become dry land by natural or artificial means.

land use suitability:

The appropriateness of a specific area for a type of use or activity; (e.g. hunting is not a suitable use in a residential area).

lead agency:

A government body which has been designated primary responsibility for the completion of an activity such as the implementation of a Management Plan.

management plan:

A document which provides the guidance required to achieve effectively an identified management goal or review of a proposed activity with respect to government requirements.

mitigation:

A measure taken in the planning, construction or operation of a project with the specific objective of avoiding or reducing adverse impacts.

monitoring:

The process of observing and measuring an object or activity over a period of time, such as the impacts of a project after completion to ensure compliance with those standards which may have been established and to determine whether the project's impacts were correctly predicted.

natural resource(s):

Air, land, water and living resources and the elements thereof produced by or resulting from nature. Natural resources may be renewable or non-renewable.

optimal:

That which results in the greatest advantage or benefit with the least disadvantage or detriment. For example, optimum sustainable yield: The amount of use of a resource that will provide the greatest benefit determined by balancing the capacity of the resource to renew itself against the intensity of the use as modified by any relevant economic, social, or ecological factors.

planning assessment:

In relation to the area designation proposed in the Management Plan, a process of conducting further studies and comparing various alternatives regarding the suitability of certain broad categories of land uses or activities. Assessment relating to planning or comparing broad options as distinct from assessment of a specific project or activity; (i.e. project assessment). Project assessment rarely includes evaluation of broad planning options, whereas planning assessment also can involve assessment of specific projects.

referral system:

A process through which a government agency refers a proposal to other appropriate agencies for their evaluation of the implications of a project. The responses are used by the agency, together with its own analysis, to form the basis for decisions regarding the proposal.

restore:

To revitalize or bring back to a former or original condition features which have been diminished or lost by past alterations, activities, or catastrophic events.

site-specific:

That which pertains to a particular site (i.e. more definitive than area-specific).

sub-tidal:

The area of a marine shore which is not regularly exposed by tidal fluctuations (e.g. below mean low tide level).

tenure:

The act, right, manner or term by which something such as a property is occupied or controlled; (i.e. lease or fee simple ownership).

water dependent:

A use or activity which can be carried out only on, in or adjacent to water areas because the use relies directly upon access to or use of the water body for transportation, recreation, energy production, or a source of water.

water related:

A use or activity which is not directly dependent upon access to a water body, but which provide goods and services that are directly associated with water dependent uses, and which, if not located adjacent to water, would result in a reduced quality of the goods or services offered.

* * * * * *

Planning Committee:

The Committee which has been responsible for overseeing the preparation of the Management Plan.

Planning Work Group:

The Work Group which was primarily responsible for consolidating material from the technical Work Groups and preparing a draft of the Management Plan for consideration by the Planning Committee.

Coordinating Committee:

The proposed Committee to be responsible for coordinating the implementation of the Management Plan (see 2.1.1).

Implementation Coordinator:

The individual to be responsible for coordinating those aspects of implementation which are of a technical or administrative nature (see 3.1.1).

Environmental Assessment Committee:

The Committee, which under the direction of the Coordinating Committee, will direct and review those environmental impact assessments required in the evaluation of proposals (see 2.4.2).

Volume

2

REPORT OF THE PLANNING COMMITTEE ON A PROPOSED

SQUAMISH ESTUARY MANAGEMENT PLAN

VOLUME TWO
APPENDICES

September 1982

Government of Canada Gouvernement du Canada

Province of British Columbia

BACKGROUND PUBLICATIONS

SQUAMISH ESTUARY MANAGEMENT PLAN

Air and Water Quality Work Group
Final Report

Habitat Work Group
Final Report

Land Use Work Group
Final Report

Recreation Work Group
Final Report

Squamish Estuary Draft Management Plan

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and by the Minister of Environment, British Columbia

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REPORT OF THE PLANNING COMMITTEE ON A PROPOSED
SQUAMISH ESTUARY MANAGEMENT PLAN
EXECUTIVE SUMMARY

PREFACE

The intention to prepare a Squamish Estuary Management Plan was announced jointly in May 1979 by the British Columbia Minister of Environment and the Canada Minister of Fisheries and Oceans. The goal of the Plan is to provide a decision-making framework which can be used to guide land and water use in the Squamish estuary, but remain flexible to allow refinement in later years.

The Plan was proposed under the supervision of a Planning Committee, with the assistance of a Planning Work Group who were largely responsible for drafting a Plan proposal, while four technical Work Groups prepared reports related to air and water quality, land and water use, recreation, and habitat. Included in these reports were recommendations for estuary improvement, and for research or studies to improve decision-making.

PART I: THE SETTING

1.0 RESOURCES, DEVELOPMENT HISTORY AND JURISDICTIONS

The Squamish estuary is located at the head of Howe Sound, occupying over 600 hectares. The Squamish area is an area with many associated uses, thereby possessing many values. Several legislative jurisdictions covering a multitude of aspects are in effect in the Squamish area.

PART II: THE PLAN PROCESS

2.0 ADMINISTRATIVE ORGANIZATION AND ENVIRONMENTAL REVIEWS

Endorsement of the Management Plan as a broadly acceptable framework within which decisions concerning the use of the estuary will be made is the first step required to implement the plan. The support of the co-sponsors of the Management Plan, and the numerous other interests with a role to play in decisions regarding use of the estuary, will be necessary.

Implementation of the Management Plan will be based upon the use of existing legislation and regulations. It will be important to improve cooperation and coordination among government agencies, possibly by formalizing these relations through protocol agreements or memoranda of understanding. To support this process, industry should prepare plans which outline their long-term objectives within the estuary.

2.1 The Implementation Structures

2.1.1 The Coordinating Committee

Coordination throughout the implementation process will be provided through the Coordinating Committee and its secretary, the Implementation

Coordinator. The Committee will be responsible to the Federal and Provincial Ministers responsible for the preparation of the Plan. The Committee will be responsible for interacting with government, the private sector, and the public. The purpose of this interaction will be to develop or recommend overall policies, to encourage steps required to ensure actions of agencies or industry are consistent with the Management Plan, and to prepare a review every 5 years of the progress of the Management Plan. As well, the Committee will determine the type of environmental review required for proposed projects, review the results of such assessments, make recommendations to regulatory agencies, make recommendations on amendments to the Management Plan, identify funding and manpower requirements for various actions associated with implementation and review the costs of and priorize actions and studies recommended in Sections 4.0 and 5.0 respectively of the Management Plan.

2.1.2 The Implementation Coordinator

The Secretary to the Coordinating Committee will act as the Implementation Coordinator and will be responsible to the Committee. The Coordinator will be responsible for the implementation of the Plan, and will work closely with technical and advisory levels of government, the private sector, and the public to provide technical support to the Coordinating Committee. The Coordinator will also review completed outlines for development proposals and make recommendations for further assessments.

2.2 The Information Bank

A public repository (Information Bank) related to the Management Plan and its implementation will be established. The Information Bank will be updated with information obtained during implementation while providing an opportunity to enhance ongoing public involvement.

2.3 Amending the Management Plan

The need for refinement of the Management Plan recognizes that numerous deficiencies presently exist in the information required to manage the estuary effectively. The Management Plan will be amended as new information becomes available and decisions are made, to guide management decisions. Refinements to the Plan would include amendments to area designations, but these and other major amendments to the Plan will require review by the public, the private sector and government. The extent of review of amendments will be determined by the Coordinating Committee.

2.4 Environmental Impact Review

All regulatory agencies and representatives of project proponents would refer all proposals to the Coordinating Committee to enable the required level of environmental impact review to be determined, based upon conformance with the intent of the Management Plan. It is intended that review processes shall not duplicate already established and adequate processes (e.g., Energy Project Review Procedures).

The preparation of development proposal outlines by the proponent will be essential to determine the required level of environmental impact assessment, if any. On the basis of the review of the outlines, the Coordinating Committee will recommend approval or disallowance of the project, or recommend specific further assessment of the proposal.

An environmental impact assessment may involve the general assessment of alternatives regarding the design and location of a proposed facility, or a more site specific assessment to determine specific environmental implications of a preferred alternative for a project. The Coordinating Committee will appoint an Environmental Assessment Committee, who will advise the proponent during the preparation of the environmental impact assessment. The Environmental Assessment Committee will review completed environmental impact assessments and report to the Coordinating Committee. The public will have an opportunity to provide written comments to the Coordinating Committee during the proposed review period.

Upon completion of this process, the Coordinating Committee will make a single report containing all its recommendations regarding the proposal to the appropriate regulatory agencies with a copy being sent to the proponent. It is intended that appropriate recommendations will be incorporated into permits and approvals issued by relevant government regulatory agencies. Any recommendations which require a major amendment to the Management Plan will be forwarded to the Ministers for ratification, prior to release.

PART III: GUIDELINES FOR MANAGEMENT

3.0 POLICY GUIDELINES AND AREA DESIGNATION

3.1 Policy Guidelines

The policy guidelines are intended to complement rather than supercede existing statutes, regulations, and guidelines. It is recognized that all environmental impact reduction actions must in principle be cost effective as well as environmentally acceptable. Guidelines have been prepared related to the following topic areas: planning and decision-making, industrial site development, development of land and water uses, habitat protection and development, log handling and processing facilities, dredging and disposal of dredged material, research proposals and recreation.

3.2 Area Designations

The diverse resource base of the Squamish estuary provides a wide range of opportunities for an equally wide range of activities. Areas within the estuary have been designated for specific types of best use into the categories Conservation, Industrial/Commerical, or Planning Assessment. Concensus agreement by the Planning Committee was required before an area would be placed into either the Conservation or Industrial/Commercial. If agreement could not be reached regarding the appropriate designation, or if necessary information was lacking, the Planning Assessment designation was used. The present designations are primarily a recognition of existing resource and industrial values within the estuary. Each designation has a specific role to play in the provision of suitable sites for various activities, and each has a set of policies which refine and supplement the management policy guidelines.

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ACKNOWLEDGEMENTS

The Planning Committee wishes to acknowledge the many agencies and individuals who contributed to the preparation of this document through their participation on the various work groups, through their submissions to the Planning Committee and the work groups and through the various other contributions they made to production of this report.

The technical specialists in the Recreation Work Group, Air and Water Quality Work Group, Habitat Work Group and Land Use Work Group played a major part in assembling the information required for preparing this Management Plan. The work of the Planning Work Group in drawing together the material assembled by the technical work groups mentioned above and by the Public Involvement Work Group was a great assistance to the Planning Committee. The Public Involvement Work Group, through its involvement during the development and review of the Draft Management Plan, has contributed to the improvement of the Plan. This report is based substantially on material contained in a draft submitted by the Planning Work Group.

The Planning Committee has placed its own interpretation and conclusions on the material made available to it, and assumes sole responsibility for the Management Plan it has recommended. The contents of this report do not necessarily reflect the policies of the governmental agencies represented on the Planning Committee or any other private or governmental agency.

PREFACE

In May, 1979, the British Columbia Minister of Environment and the Canada Minister of Fisheries and Oceans announced their decision to develop a Squamish Estuary Management Plan. They directed that a Planning Committee be established to prepare the Plan and that it include representatives of the federal, provincial and municipal governments and private industry. An independent consultant, Mr. W. Winston Mair, was appointed to review the report of the Planning Committee and advise the two Ministers.

The terms of reference of the Planning Committee provide for the participants to work together to develop a plan for the use of the estuary that would optimize resource/habitat values while providing for the long-term trade, development and energy requirements of the community and province. The organizational framework for the planning process is presented in the terms of reference of the Planning Committee (Appendix A).

The goal of the Squamish Estuary Management Plan is to provide a decision-making framework which can be used to guide land and water use in the Squamish Estuary. The Management Plan is intended to be ongoing and flexible in order to allow refinement as more information becomes available. To this end, it includes suggestions for the resolution of certain existing resource conflicts and recommendations for improved procedures and further research and analysis. Therefore, the Management Plan provides a decision-making framework for managing the use of the estuary rather than a rigid land and water use plan.

The Management Plan consists of three major parts:

1. the resource, historical and jurisdictional setting;
2. the plan process for coordinating the involvement of agencies and other interests; and
3. the guidelines for management

These are contained in Volume One. Collectively, these components provide an opportunity for the resolution of existing resource use conflicts and for guiding future estuary management decisions. Volume Two of this report consists of appendices containing supporting information.

A glossary of terms is provided at the back of Volume One to clarify the technical terminology used in the report.

The lands within the management plan area are held in part by the Crown Provincial and in part by corporations and/or private owners. It is not the intention of this Management Plan to address itself to compensation to the owners of the lands for loss by reason of implementation hereof.

Part IV Appendices

Appendix A

PART IV: APPENDICES

APPENDIX A: TERMS OF REFERENCE AND ORGANIZATION FOR THE PLANNING STUDY

A.1 Planning Committee Terms of Reference

For organizational and reporting structure see Figure A-1.

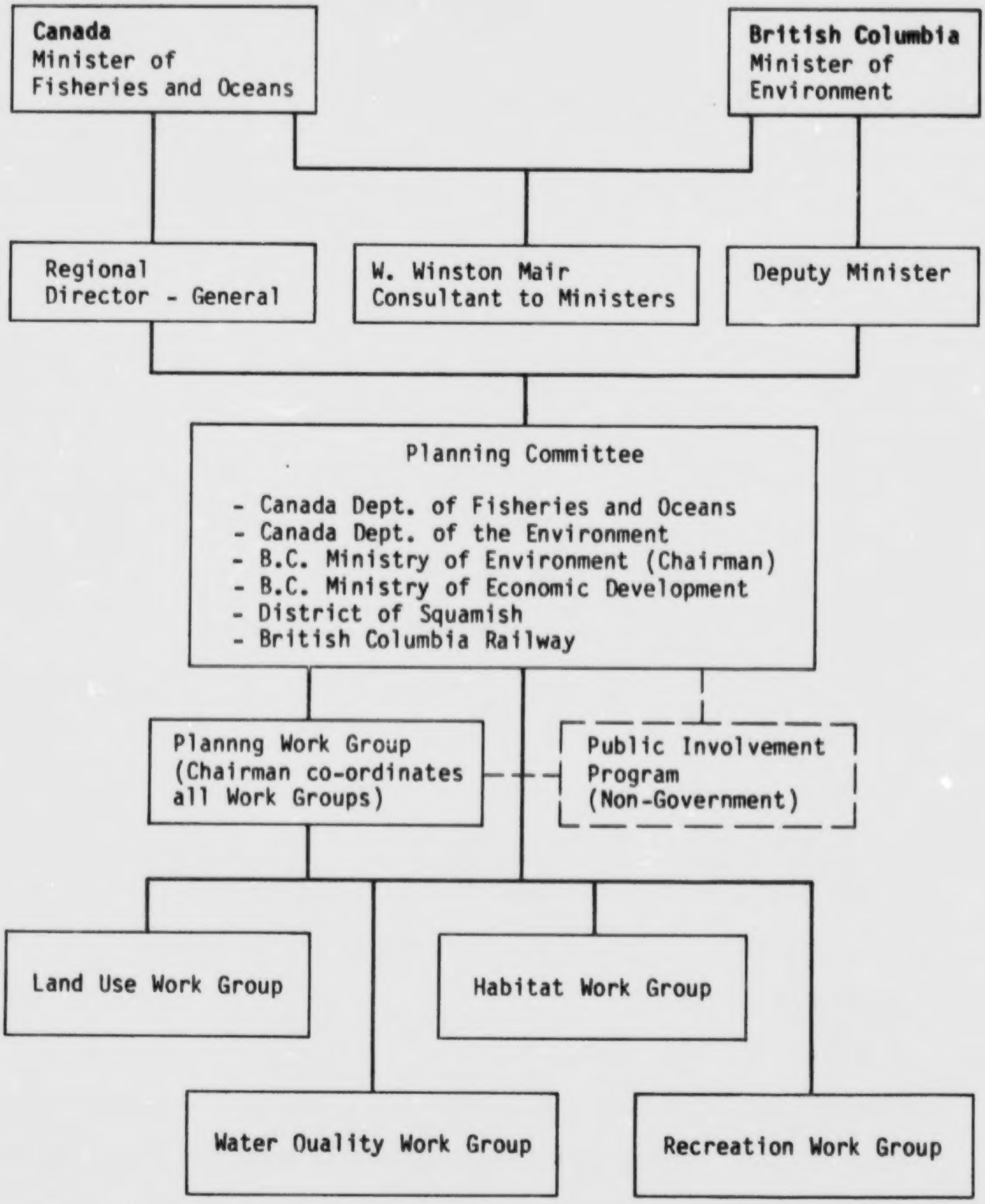
1. The Planning Committee shall coordinate the various tasks performed and be responsible for the preparation of a Squamish Estuary Management Plan for consideration by the Minister of Fisheries and Oceans for Canada and the Minister of Environment for British Columbia. The Planning Committee shall have a member appointed by each of the following:

   Canada Department of Fisheries and Oceans
   Canada Department of the Environment
   B.C. Ministry of Environment
   B.C. Ministry of Industry and Small Business Development
   District of Squamish
   British Columbia Railway

   The member appointed by the B.C. Ministry of Environment shall act as Chairman of the Planning Committee. The member appointed by the Canada Department of Fisheries and Oceans shall be vice-chairman.

TABLE A-1

Organizational and Reporting Structure


Canada
Minister of Fisheries and Oceans
British Columbia
Minister of Environment
Regional Director - General
W. Winston Mair Consultant to Ministers
Deputy Minister
Planning Committee
- Canada Dept. of Fisheries and Oceans
- Canada Dept. of the Environment
- B.C. Ministry of Environment (Chairman)
- B.C. Ministry of Economic Development
- District of Squamish
- British Columbia Railway
Plannng Work Group (Chairman co-ordinates all Work Groups)
Public Involvement Program (Non-Government)
Land Use Work Group
Habitat Work Group
Water Quality Work Group
Recreation Work Group

2. Secretarial functions shall be performed by the B.C. Ministry of Environment under direction of the Chairman.

3. The area subject to the Management Plan shall include all those lands above the 5 fathom (9 m) depth line and subject to flooding by the highest high tide. This area is loosely defined on an interim basis as bounded on the north by a line joining the southern limit of the Yekwaupsum Indian Reserve No. 19 on the west bank of the Squamish River with the south bank of the Mamquam River at the British Columbia Railway bridge, on the west by the natural high water line, on the south by the 5 fathom (9 m) depth contour, and on the east by the natural high water line along the east side of the blind Mamquam Channel, and the west side of the blind Mamquam Channel as far south as the dyke surrounding the urban area on the seaward side; the remainder of the eastern boundary shall be the dyke surrounding the urban area on the south and west as far north as the British Columbia Railway track, the railway track as far north as the marshalling yards, the dyke on the west side of the marshalling yards and Yekwaupsum Indian Reserve No. 18 (L. 4263) and the railway track from the north end of the marshalling yards to the bridge across the Mamquam River. A more exact definition of the subject area would be resolved by discussion in the Planning Committee and shall be subject to approval by the Regional Director General, Fisheries and Oceans Canada, and the B.C. Deputy Minister of Environment. The subject area is illustrated in Figure 1,

Volume 1. An additional perimeter zone up to 500 metres wide may be considered on any margin of the subject area where such consideration is in keeping with the objectives of the Planning Committee.

4. The Planning Committee shall not be provided with a special budget or staff other than those funds and staff that member organizations can make available for component tasks.

5. The prime reliance shall be placed upon existing information sources. Supplementary information critical to decision-making may be collected by organizations carrying out component tasks at their own expense, subject to endorsement by the Planning Committee and the completion of those tasks assigned by the Planning Committee within the period specified by the Planning Committee.

6. The Planning Committee shall provide, on or before 30 May 1980, a draft interim management plan and document any need for information necessary to complete the final Squamish Estuary Management Plan, and associated costs.

7. The Planning Committee shall present a final Squamish Estuary Management Plan to the Federal and Provincial Ministers on or before 15 November 1981.

8. The draft interim management plan presented on or before 30 May 1980 shall be accompanied by a draft proposal outlining a public involvement program for the purpose of involving the public in the development of the final Squamish Estuary Management Plan.

9. The Planning Committee shall appoint a series of Work Groups to coordinate and carry out tasks under its direction. These Work Groups shall draft specific terms of reference, plans and schedules for the appropriate component tasks, for the approval of the Planning Committee. Appointment to Work Groups shall be conditional on willingness of the appointee and his/her agency to perform the work required. Agencies appointed to Work Groups may employ as many workers as they desire to perform their allotted and committed tasks, at their own expense. The specific Work Groups and their participating membership shall include but not necessarily be limited to the following:

Planning Work Group

B.C. Ministry of Environment (W.I.B.)
B.C. Ministry of Economic Development
Canada Department of Fisheries and Oceans
Canada Department of the Environment
District of Squamish

This Work Group shall synthesize information from other Work Groups, public involvement, and other sources, into an information summary report which will include recommendations for the Management Plan. This Work Group shall prepare the draft interim Management Plan for review by other Work Groups and the Planning Committee.

Land Use Work Group

B.C. Ministry of Environment (W.I.B.)
B.C. Ministry of Lands, Parks and Housing (L.M.B.)
B.C. Ministry of Economic Development
Canada Department of Fisheries and Oceans
District of Squamish
British Columbia Railway

This Work Group shall assemble and discuss all information related to existing land use, existing policies regarding land use at all levels of government, land use capabilities, and anticipated future needs. It shall identify policy options for land use and means to resolve conflicts for consideration by the Planning Work Group and Planning Committee. It shall identify and priorize information gaps which prevent or hinder completion of the Management Plan and undertake work approved by the Planning Committee to secure needed information.

Habitat Work Group

B.C. Ministry of Environment (F. & W. Br., R.A.B., W.I.B.)
Canada Department of Fisheries and Oceans (P.E.I., H.P.D.)
Canada Department of the Environment (C.W.S.)

This Work Group shall describe the fish, wildlife and habitat characteristics of the subject area, and priorize habitat for preservation and conservancy uses. It shall identify and make recommendations concerning opportunities for maintenance, restoration and enhancement of habitat. It shall identify and priorize information gaps which prevent or hinder completion of the Management Plan and undertake work approved by the Planning Committee to secure needed information.

Water Quality Work Group*

B.C. Ministry of Environment (W.I.B., P.C.B.)
Canada Department of the Environment (I.W.D., E.P.S.)
Canada Department of Fisheries and Oceans (H.P.D.)

This Work Group shall describe and appraise the existing state of water quality and factors affecting it, and recommend management guidelines which will preserve the water quality, or improve it if needed. It shall identify and priorize information gaps which prevent or hinder completion of the Management Plan and undertake work approved by the Planning Committee to secure needed information.

Recreation Work Group

B.C. Ministry of Lands, Parks and Housing (Parks)
B.C. Ministry of Environment (F. & W. Br. and/or R.A.B.)
Canada Department of the Environment (Lands Directorate)
District of Squamish

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* The Work Group was later renamed the Air and Water Quality Work Group with its focus adjusted to assess air quality as well as water quality.

This Work Group shall identify and describe the recreational potentials of the subject area and recommend means to restore, maintain or enhance the recreational potential. It shall identify and priorize information gaps which prevent or hinder completion of the Management Plan and undertake work approved by the Planning Committee to secure needed information.

Work Groups shall appoint their own chairman to provide co-ordination of all tasks assigned to the Work Group and to report to the Planning Committee.

10. The chairman of the Planning Work Group shall act as Co-ordinator of Work Groups, and shall foster liaison between Work Groups, promote adherence of Work Groups to their schedules, and other related duties as required.

11. Work Groups shall assemble, review and evaluate all available information, plans and policies respecting their areas of responsibility, and evaluate the validity of existing plans and policies in the light of the information base. They shall identify critical gaps in information and recommend appropriate measures to the Planning Committee for securing necessary supplementary information. They shall recommend to the Planning Work Group and the Planning Committee measures or policies for incorporation into the estuary Management

Plan. The Work Groups shall also contribute to development of the interim management plan as may be appropriate.

12. Work Groups shall undertake such investigations as may be assigned by the Planning Committee to improve the information base.

13. Work Groups shall prepare final reports to the Planning Committee and Planning Work Group on tasks performed and on the resulting conclusions and recommendations.

14. The Squamish Estuary Management Plan shall define areas suitable for:
    1) Preservation (no alteration);
    2) Conservancy use, for protection or enhancement of fisheries, wildlife and recreational resource values;
    3) Industrial or commercial development with appropriate designation of the type and/or scale of development suitable;
    4) Mixed-use;
    5) Unclassified status, for reasons of insufficient information, unresolved conflicts, or other compelling reasons.

    The specific criteria upon which the first four use designations should be based shall be specified, and should include consideration of:

    1) Present use,
    2) Potential uses,

3) Biophysical factors,
4) Social and cultural factors,
5) Aesthetic factors, and
6) Economic factors

Use designations for each area shall include:

1) The specific criteria upon which the recommendation for that use is based, for each designated area, and
2) Policy and management guidelines appropriate for each designated area. The guidelines should include a basic statement of the management objectives for each designated area and one or more management guidelines to guide administrators in the realization of the management objectives for each designated area. (A hypothetical example for "Preservation" lands might be:

   Management Objective:

   (1) to preserve in perpetuity the area in a condition unmodified by man and subject only to natural forces or ecological succession.
   (2) to provide for educational and scientific uses which do not significantly alter the designated area.

   Management Guideline:

   (1) prohibit all major man-induced changes such as water regime alterations, alterations to sediment deposition,

excavations, filling, fishing, hunting, resource extraction, and other disruptive activities.

(2) prevent human activities other than those which further the management objectives and are expressly approved and limited by a regulatory authority responsible for management of the designated area and for attainment of the management objectives.

(3) establish or identify the regulatory authority which shall act as custodian of the designated area.

15. The Management Plan shall incorporate a specified process for resolving conflicts over the designated use for land parcels and for making incremental adjustments and refinements in use designations from time to time as circumstances require.

16. The Management Plan shall incorporate a specified administrative structure and processes for implementing its provisions and subsequent revisions.

17. The Management Plan shall incorporate a proposal for establishment of an information repository which can be used to store and retrieve any information relating to the Management Plan, its administration, and activities affecting, or affected by, it. The proposed repository shall include provision for review of deposited information and for public access to both the deposited information and reviews thereof.

18. The Management Plan shall incorporate recommendations for a program to collect any necessary further information about unclassified areas.

19. There shall be a Public Involvement process to include non-government agencies, interest groups, etc.; the terms of reference for this process will be drafted by the Planning Work Group, finalized by the Public Involvement participants and approved by the Planning Committee and the Ministers.

A.2 Plan Participants

Planning Committee

R.J. Buchanan, Chairman - Ministry of Environment
F.C. Boyd, Vice-Chairman - Department of Fisheries and Oceans
B.A. Heskin - Environmental Protection Service
G.B. McRae - Ministry of Industry and Small Business Development
N.F. Candy - District of Squamish
G.L. Ritchie/E.H. Rutley - B.C. Rail
P.D. Albertson, Secretary - Ministry of Environment

Planning Work Group

J.P. Secter, Chairman until May, 1980 - Ministry of Environment
G.K. Lambertsen, Chairman after May, 1980 - Ministry of Environment
N.F. Candy - District of Squamish
G. Sandve - Ministry of Industry and Small Business Development
G. Packman, until June, 1980 - Environmental Protection Service
L. Harding, after June, 1980 - Environmental Protection Service
M. Pomeroy, after June, 1981 - Environmental Protection Service
W. Schouwenburg, until June, 1980 - Department of Fisheries and Oceans
R. Bell-Irving, after August, 1980 - Department of Fisheries and Oceans

Resource Staff:

S.L. Abs - Ministry of Environment
K. Koncohrada - Ministy of Industry and Small Business Development
W.B. Morgan - Ministry of Environment
R.N. Stewart - Ministry of Environment

Land Use Work Group

G. Sandve, Chairman - Ministry of Industry and Small Business Development

E.H. Rutley - B.C. Rail

J. Payne - Department of Fisheries and Oceans

I.L. Boscariol - Mayor, District of Squamish

L. Sorken - Ministry of Lands, Parks and Housing

S. Smith - Ministry of Environment

E. Khan - Ministry of Transportation and Highways

Resource Contact:

Dr. D. Gordon - Department of Indian and Northern Affairs

Habitat Work Group

R. Bell-Irving, Chairman until May, 1980 - Department of Fisheries and Oceans

B. Cox, Chairman after May, 1980 - Ministry of Environment

B. Raymond - Department of Fisheries and Oceans

D. Blower - Ministry of Environment

D. Trethewey - Canadian Wildlife Service

J. Jordan - Beak Consultants (for District of Squamish)

Resource Contact:

R.L. Morley - Ministry of Environment

Air and Water Quality

R.W. Drinnan, Chairman until June, 1980	- Ministry of Environment
L.A. Gregory, Chairman until October, 1980	- Ministry of Environment
L.G. Swain, Chairman after October, 1980	- Ministry of Environment
G. Gough	- Ministry of Environment
G. Packman, until June, 1980	- Environmental Protection Service
D. Sullivan, after June, 1980	- Environmental Protection Service
R. Harbo, until June, 1980	- Department of Fisheries and Oceans
P. Futer, after June, 1980	- Department of Fisheries and Oceans
M.C. Gow	- Ministry of Environment
M.J.R. Clark	- Ministry of Environment

Recreation Work Group

D. Bruce, Chairman until October, 1980	- Ministry of Lands, Parks and Housing
M. Turner, Chairman after October, 1980	- Ministry of Lands, Parks and Housing
D. Williamson	- Ministry of Environment
I.L. Boscariol	- Mayor, District of Squamish

Public Involvement Work Group

J.K. Strathers (Chairman until December 1981) - Squamish Yacht Club (until December 1981)

L.C. Kindree (Chairman after December 1981) - Squamish Rotary Club

D. McAteer, Secretary - Leaseholder

C. Elliot, Treasurer (later T. Halvorson) - Local Amateur Sports

E. Marcotte (alternate Treasurer - became treasurer March 31, 1982) - Local Amateur Sports (alternate for C. Elliot)

N. Halvorson - Independent Squamish Logging Operators

T. Halvorson - Leaseholder

C. Billy - Squamish Indian Band

J. Jyrkkanen (replaced by B. Giles) - Squamish Estuary Nature Centre *ad hoc* Committee

R. Schlyecher (replaced by F. Collard) - Squamish Chamber of Commerce

A. Oloman - Steelhead Society of British Columbia

M. Lennox - Concerned Citizen

M. Payton, Secretary (replaced as member by M. Tetachuk, as secretary by D. McAteer) - Squamish Valley Rod and Gun Club

G. Cotter - Squamish Yacht Club (after December 1982)

Consultant to Federal and Provincial Ministers

W. Mair

Appendix B

APPENDIX B: APPROACHES USED IN DEVELOPING THE PLAN

As estuary planning is still a relatively new field, it is felt that it would be useful to outline some aspects of Plan Preparation. The terms of reference set out in Appendix A specify elements to be included in the Plan and planning process. As the study progressed, the original outline was modified to better suit the evolving process. These changes occurred as information from work groups became available and as plan participants considered alternative management approaches.

In the terms of reference, five area designation categories were suggested. A variety of more and less complex designation systems were discussed during the planning process. The final decision was to use three basic categories and to address specific management needs for each area under site-specific guidelines.

It was the intention of the Planning Committee to release an interim draft plan in mid-1980. This timing was adjusted to allow for preparation of a more comprehensive draft plan.

The following approaches are among those used by the Planning Work Group in preparing the Plan.

B.1 Comparisons With Other Studies

Government agencies in both Canada and the United States of America with jurisdiction in coastal areas have produced a variety of shore management plans and programs which provide references for estuary planning. Although the methods and the details of each of these are specific to a particular context, some approaches have been applied to the Squamish situation. The following documents were examined for identification of both appropriate elements to be incorporated into the Plan process and problems to be avoided.

1. Fraser River Estuary Study, in progress, joint Federal-Provincial study.

2. Sooke Foreshore Management Plan, February 1980, B.C. Ministry of Lands, Parks and Housing, Lands and Housing Regional Operations Division.

3. Cowichan Estuary Task Force Study, November 1980, Environment and Land Use Committee Secretariat.

4. Columbia River Estuary Regional Management Plan, June 1979, edited by Ian McColgin, Columbia River Estuary Task Force.

5. King County Shoreline Management Master Program, June 1978, Department of Planning and Community Development, King County.

6. Seattle Shoreline Master Program, October 1976, Seattle Department of Community Development.

7. Whatcom County Shoreline Management Program, June 1978, Whatcom County Planning Department, Bellingham, Washington.

8. Grays Harbor Estuary Management Plan, 1978, Montagne-Bierly and Associates, Wilsey and Ham for Regional Planning Commission, Grays Harbor, Washington.

B.2 Preliminary Management Exercises: Grid Questionnaire

Two preliminary management exercises concerning present and future estuary use were sent out to government agencies and public organizations involved in the Squamish estuary early in the planning process. Their purpose was to determine the degrees of consensus and conflict in the estuary, given the information available at the time. This was to assist the Planning Work Group in identifying areas of consensus, focussing on areas of disagreement, and identifying issues to be addressed in the Plan.

In Exercise I, "Preliminary Management Designations," an air-photo mosaic of the estuary was overlain by a grid which created 104 reference squares. Participants were asked to assign each square to a defined category. The choices provided were: A - Conservancy, B - Development, and C - Assessment. Exercise II, "Issues, Concerns and Conflicts", asked for an enumerated list of outstanding issues and concerns in the Squamish estuary. Respondents were asked to describe the location, background and basis of each problem and to give suggestions for its resolution.

Forty-one questionnaires were sent out; twenty-four were returned. Eight of these submitted written comments only and three designated only limited areas of concern.

A - Conservancy - Agreement was 100% for the west side of the estuary, including the channel and intertidal areas of the west delta and most of the central delta. Responses for the undeveloped sections of the east delta still favoured Conservancy, but less decidedly: 80-90% agreement.

B - Development - There were no areas of greater than 80% agreement. However, 90% of responses favoured either Development or Assessment for the west side of Mamquam Channel.

C - Assessment - There was no agreement greater than 60%. Assessment responses clustered around Mamquam Channel, especially at the north end, and around the central estuary just west of the town centre of Squamish.

There was substantial disageement for all other areas. These areas received priority attention in Plan preparation.

The response level for these exercises was insufficient to conduct detailed statistical analysis. However, the mapping of the results assisted the Planning Work Group by indicating areas of particular concern. This information provided an initial context for interpretation of the inventory and planning-oriented information which was made available through the Technical Work Groups.

B.3 Public Involvement Work Group

In order to facilitate contributions by the public to the planning process for the Squamish estuary, a Public Involvement Work Group was formed. To initiate this aspect of the Plan, a public meeting was held in Squamish by the Planning Committee. The purpose of this meeting was to introduce the local community to the resource management approach of the Plan and to the role of the public in the process. The 120 people who attended were invited to nominate representatives from local interest groups, non-governmental organizations and the local community to form the Public Involvement Work Group (P.I.W.G.). This group was to act as a liaison between the public and the rest of the Plan participants by encouraging awareness of study activities and results and by coordinating and promoting public contributions to the process. Details as to how this was to be done were the sole responsibility of the P.I.W.G., although financial and technical resources were made available upon request through the Planning Committee. A set of clarified reference guidelines for the Public Involvement Program is listed below.

CLARIFIED

REFERENCE GUIDELINES FOR
PUBLIC INVOLVEMENT PROGRAM,
SQUAMISH ESTUARY MANAGEMENT PLANNING STUDY

1. The PLANNING COMMITTEE shall develop and co-ordinate a PUBLIC INVOLVEMENT PROGRAM, the objective of which is to foster a comprehensive liaison with all interest and user groups applicable to the study area.

2. To assist it in its stated purpose, the PLANNING COMMITTEE shall call together a PUBLIC INVOLVEMENT WORK GROUP.

3. The PUBLIC INVOLVEMENT WORK GROUP, struck to facilitate the development and co-ordination of a PUBLIC INVOLVEMENT PROGRAM, shall act to foster liaison with the concerned public as part of this program for the purpose of informing the general public about the management planning study and for obtaining public input, through consultations and advisory meetings, into the refinement of this planning exercise.

4. The PLANNING COMMITTEE shall delegate a person to sit with the PUBLIC INVOLVEMENT WORK GROUP and to act as a contact/resource person and advisor.

5. The PUBLIC INVOLVEMENT WORK GROUP shall consist of non-government organizations such as the Chamber of Commerce, and local public and special interest groups. The PUBLIC INVOLVEMENT WORK GROUP shall notify the

PLANNING COMMITTEE regarding the membership and affiliation of its members.

6. The PUBLIC INVOLVEMENT WORK GROUP shall appoint their own chairman to provide co-ordination of all tasks involving the work group, to liaise with the chairman of the PLANNING WORK GROUP, and to report to the PLANNING COMMITTEE as required.

7. The PUBLIC INVOLVEMENT WORK GROUP shall participate within the Management Plan organizational and reporting structure, as shown in the attached chart. Provision has been made for work group interaction and communication with other work groups through the auspices of the chairman of the PLANNING WORK GROUP. In addition, the work group shall report directly to the PLANNING COMMITTEE as required.

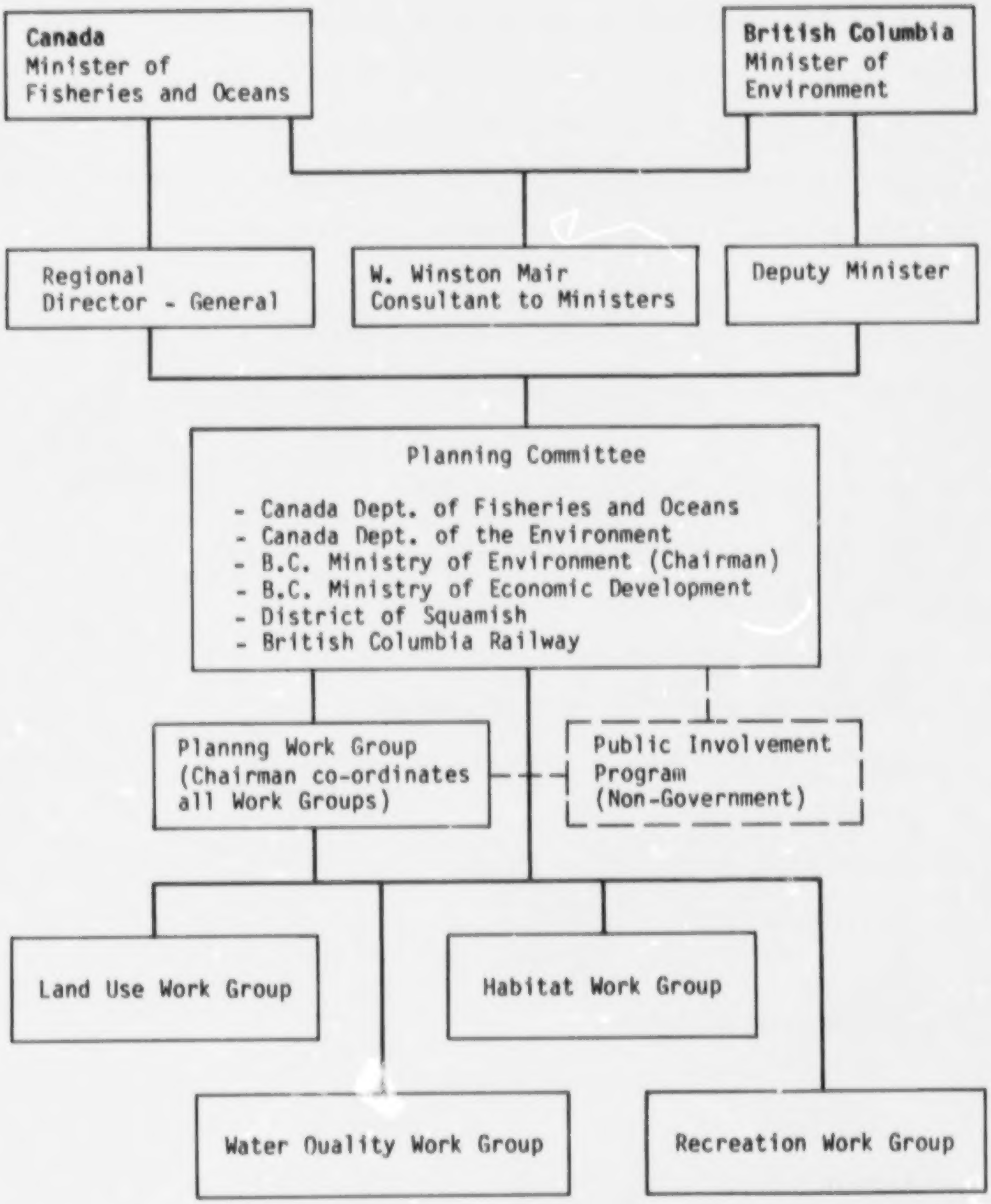
8. The PUBLIC INVOLVEMENT WORK GROUP shall be responsible for assisting the PLANNING COMMITTEE in informing the public about the process for development of a Management Plan, the nature and scope of the information assembled and generated in formulating the final Management Plan, co-ordinating the dissemination of relevant information to the public, organizing reviews and responses to such information by the public and consulting with the PLANNING WORK GROUP to provide input and advice to the Management Plan regarding local issues.

9. Information, Work Group reports, etc. shall be obtained by the PUBLIC INVOLVEMENT WORK GROUP chairman through the PLANNING WORK GROUP

chairman. Similarly, the PUBLIC INVOLVEMENT WORK GROUP chairman will convey local issues and concerns raised by the public through consultations with the PLANNING WORK GROUP chairman, as appropriate, for the purposes of contributing such input to the formulation of the Management Plan.

10. The PUBLIC INVOLVEMENT WORK GROUP shall co-ordinate review and discussion by the general public of the final reports of the various work groups and in doing so prepare its final response to the PLANNING COMMITTEE for incorporation into the final SQUAMISH ESTUARY MANAGEMENT PLAN.

Organizational and Reporting Structure


Canada
Minister of
Fisheries and Oceans
British Columbia
Minister of
Environment
Regional
Director - General
W. Winston Mair
Consultant to Ministers
Deputy Minister
Planning Committee
- Canada Dept. of Fisheries and Oceans
- Canada Dept. of the Environment
- B.C. Ministry of Environment (Chairman)
- B.C. Ministry of Economic Development
- District of Squamish
- British Columbia Railway
Plannng Work Group
(Chairman co-ordinates
all Work Groups)
Public Involvement
Program
(Non-Government)
Land Use Work Group
Habitat Work Group
Water Quality Work Group
Recreation Work Group

During the Plan preparation, the P.I.W.G. held regular open meetings in Squamish, with guest speakers and discussion topics. Meeting minutes and copies of all briefs were submitted to the Planning Work Group to aid in providing an indication of community issues and viewpoints. As well, the P.I.W.G. distributed copies of all Plan documents to the public and maintained an information table at the public library.

Briefs which were considered in the preparation of the Draft Plan were received from the following groups and individuals:

British Columbia Steelhead Society
British Columbia Wildlife Federation
Council of Forest Industries
Independent Squamish Logging Operators Ltd.
Squamish and District Chamber of Commerce
Squamish Estuary Nature Centre _ad hoc_ Committee
Squamish Terminals
Squamish Valley Rod and Gun Club
Squamish Yacht Club

Letters were received from:

Trevor Jones
Kathryn Kennedy
Squamish Ski and Outdoor Club

B.4 Planning Work Group Workshops

As an aid to integrating technical work group information and resource people into the formulation of Plan recommendations, two workshops were held. These were attended by the Planning Work Group, Technical Work Group representatives and Ministry of Environment resource staff. Maps, overlays and working drafts of various Plan chapters were examined and discussed during the workshops.

These work shops provided a forum for an exchange of views and a chance to work towards agreement on elements of the Plan. Background data and knowledge of the data-gaps provided through the Technical Work Groups were incorporated with the planning approach to produce a Draft Plan that was workable and acceptable to Plan participants at that level of the planning organization.

The draft of the Management Plan prepared by the Planning Work Group was submitted to the Planning Committee for consideration in preparing the version the Planning Committee approved for publication.

Appendix C

APPENDIX C: JURISDICTIONAL SETTING

Decisions regulating the use of the Squamish estuary stem from a complex system of jurisdictional authority guiding the actions of federal, provincial, regional and local levels of government. This appendix provides an overview of jurisdictional authority within the Squamish estuary.

The jurisdictional authority of a government agency is based upon legislation enabling the agency to undertake defined actions. Within the scope of responsibilities defined by the legislation, the jurisdictional authority of an agency is often supplemented by regulations. Interpretation of the extent of jurisdictional authority is reflected in the policies and practices of an agency. Further interpretation of the extent of an agency's jurisdictional authority may involve the judiciary when prosecution is initiated under a statute or when an agency's action is contested in court. The effectiveness of a statute largely depends upon how the agency responsible for its administration establishes and implements policies and practices.

The Constitution Act, 1982 separates the respective jurisdictional authority of the federal and provincial governments. This division of authority is not substantially different from that provided under the British North America Act, 1867. The Constitution Act, 1982 changed the name of the BNA Act, 1867 and all revisions thereto to the Constitution Act. At the time of Confederation, the generally-worded provisions of the BNA Act (now renamed the Constitution Act) were thought to be adequate for solving constitutional disagreements that might arise between the two levels of government. However, many of the sections within the Act have been subject to very broad interpretation. This has resulted in the development of several areas of jurisdictional overlap between the federal and provincial governments.

Ownership is the fundamental determinant of jurisdictional authority. In this regard, jurisdiction has been classified under two basic categories: that which is proprietary and that which is regulatory. Provincial proprietary jurisdiction is derived from the ownership of public land and natural resources. Federal proprietary jurisdiction is limited within a province to property owned by the federal government. Provincial regulatory jurisdiction is based upon its proprietary jurisdiction, while most federal regulatory jurisdiction has been provided through the Constitution Act.

Amidst the various forms of government jurisdiction are the rights of the private property owner. Aside from the aspects specifically covered by statutory law, the rights of the private property owner are protected through British common law. Generally, an individual property owner is free to do as one chooses provided the effects of such actions remain confined to the bounds of one's property.

The areas of jurisdiction which are applicable to use of the Squamish estuary are described in the following sections.

C.1 Federal

Federal jurisdiction specified in the Constitution Act includes responsibility for navigation and shipping, protection and management of fisheries and migratory birds, lands reserved for native people, and matters of national concern. In relation to matters of national concern, the federal government has enacted laws and regulations controlling environmental contaminants and ocean dumping. The federal government does not possess proprietary jurisdiction in the Squamish estuary but does have indirect control over estuary use through its regulatory jurisdiction.

The Fisheries Act, among other things, provides for the protection of fish habitat and the fishery resource in general. The Act is administered by Fisheries and Oceans Canada with the assistance of Environment Canada.

Fisheries and Oceans Canada participates in referral systems with numerous federal and provincial agencies, Crown corporations and municipalities. Through both formal and informal processes, Fisheries and Oceans Canada is advised of activities which may damage the fishery resource and supporting habitats.

Fisheries and Oceans Canada encourages developers to avoid sensitive habitat areas and seeks early consultation with proponents to direct them to areas where fisheries impacts would be low. Through a technical service, Fisheries and Oceans Canada determines the magnitude of associated impacts and identifies various methods for mitigating adverse impacts or enhancing beneficial effects. Fisheries and Oceans Canada can suggest conditions for approval concerning the location, design, construction or operation of a proposed activity.

The Fisheries Act also regulates the deposition of substances considered to be harmful to fish. The Environmental Protection Service of Environment Canada administers this part of the Act. Limits for the amounts of substances that can be discharged have been established through regulations. Limits for discharges which are not covered in the regulations are determined on a site specific basis. To minimize duplication of effort, the Environmental Protection Service usually implements these regulations through the permit system of the Waste Management Branch, B.C. Ministry of Environment. However, the Environmental Protection Service does retain the right to act independently to enforce its regulations.

Under the Fisheries Act, provisions exist for establishing regulations for the reporting of spills of harmful substances and for ordering those responsible for spills to clean them up. The Environmental Protection Service urges operations which could have accidental spills of chemical or petroleum products to locate away from areas sensitive to damage from such spills and to construct facilities with protective devices designed to mitigate spills.

If an activity affecting fish habitat proceeds without approval or in contravention of conditions for approval imposed under the Fisheries Act, the Act can be used to halt such activities and prosecute offenders.

Protection of migratory birds in the estuary is provided under the Migratory Birds Convention Act which empowers Environment Canada to regulate hunting. The Canada Wildlife Act enables the federal government to acquire and enhance habitat of importance to migratory birds. The Canadian Wildlife Service of Environment Canada administers these two acts by monitoring bird populations, setting hunting seasons and bag limits, and acquiring and managing areas of productive habitat.

The Ocean Dumping Control Act controls the dumping of wastes and other substances into the ocean. This Act is administered by the Environmental Protection Service of Environment Canada. Anyone wishing to dispose of wastes in the ocean must first obtain an Ocean Dumping Permit. In estuaries, the jurisdiction of the Ocean Dumping Control Act extends to the upstream limit of the tidal effect.

The Environmental Contaminants Act regulates the release, importation, manufacture and sale of substances considered to be contaminants. The Environmental Protection Service, which administers the Act in cooperation with Health and Welfare Canada, maintains an inventory record of environmental contaminants being used or manufactured in Canada. The Environmental Protection Service requires that they be notified by persons intending to use or import those substances specified in the Act's regulations. The Environmental Protection Service also monitors the accumulation of various contaminants in receiving environments.

Under the Clean Air Act, the Environmental Protection Service has established air quality objectives and emission standards and guidelines, and relies upon the permit system of the Waste Management Branch, B.C. Ministry of Environment for their implementation

The Canada Water Act provides for the management of water resources through cooperative action by the federal and provincial governments. Federal-Provincial agreements can be established under the Act to undertake research, to plan and implement programs relating to flood damage prevention, conservation and use of water resources, control pollution and to provide greater knowledge of water resources in Canada. The Inland Waters Directorate of Environment Canada has been developing water quality criteria for specific water uses. These criteria are used to prepare receiving water quality objectives in cooperation with the provincial government.

Transport Canada regulates the use of inland and offshore navigable waters under the Navigable Waters Protection Act. The purpose of the Act is to regulate obstructions to navigable waters. This jurisdiction applies to all waters that have been designated as being navigable under the Act.

The Environmental Protection Service coordinates review of referrals from Transport Canada involving potential environmental impacts through the other agencies within Environment Canada and Fisheries and Oceans Canada. Referrals also are received by a number of provincial government agencies.

In addition to the preceding legislation, the federal government has also established a policy for assessing the environmental impacts of projects it sponsors. This policy, established by the Federal Cabinet, provides an opportunity for projects undertaken by a federal agency or requiring federal funds to be subject to the Federal Environmental Assessment and Review Process (EARP).

EARP is a self-assessment process whereby federal agencies review all their projects with regard to environmental effects. The proponent agency may refer a project it has identified as involving significant environmental effects to the Federal Minister of the Environment for review by an Environmental Assessment Panel. The Federal Environmental Assessment and Review Office (FEARO) administers the process on behalf of the Minister. An Environmental Impact Statement is prepared by the proponent agency and is followed by a review process which includes public hearings. The Panel prepares recommendations for the Federal Minister of Environment which are to be implemented by the proponent agency.

In addition to EARP, Environment Canada maintains a referral system to provide advice to federal agencies and private developers regarding the environmental impacts of proposed projects. The referral system is intended to identify available sources of information, potential environmental impacts, applicable environmental protection requirements and options for mitigating impacts. The Regional Screening and Coordinating Committee (RSCC) is comprised of representatives from all agencies within Environment Canada and from Fisheries and Oceans Canada. This Committee reviews major development proposals to identify potential environmental impacts.

For projects which are subject to a particular area of federal jurisdiction, the appropriate agency within the RSCC is designated as a lead agency. The lead agency guides an internal review process in which the other Committee member agencies participate. For example, a project involving landfill over fish habitat would be primarily subject to the Fisheries Act and Fisheries and Oceans Canada would be designated as the lead agency. The result of an internal review is a coordinated federal environmental position on the project and a single set of federal environmental conditions for approval of the project.

C.2 Provincial

Ownership of public lands and natural resources and authority to legislate has provided the provincial government with the basis upon which virtually every type of land and resource use in British Columbia can be affected. The Province's extensive proprietary and regulatory jurisdiction directly affects the economic development of resources as well as their conservation and management.

Through the Constitution Act, provincial proprietary jurisdiction applies to all land, water, forests, minerals, and land covered by water. Provincial jurisdiction also applies to the foreshore and beds of inland coastal waters. Other areas of jurisdiction conferred to the Province under the Constitution Act include municipal institutions, property and civil rights, local public works, and generally all matters of a local or private nature.

The Environment and Land Use Act established the Environment and Land Use Committee of the Provincial Cabinet. This Cabinet Committee consists of the Ministers of Environment (Chairman); Agriculture and Food; Energy, Mines and Petroleum Resources; Forests; Health; Industry and Small Business Development; Tourism; Lands, Parks and Housing; Municipal Affairs; and Transportation and Highways. The Environment and Land Use Act empowers the Committee to establish and recommend programs designed to foster public concern and awareness of the environment, to ensure that all aspects of preservation and maintenance of the natural environment are fully considered in the administration of land use and resource development and generally to study any matter pertaining to the environment and land use. In carrying out this mandate, the Committee may make recommendations to the Lieutenant-Governor in Council regarding any matter relating to the environment, land use and resource development which are binding on other statutes.

The Environment and Land Use Committee performs a major coordinating role in the determination of policies relating to land and resource use and environmental management in British Columbia. The Committee receives the information and advice it requires to carry out this role through agencies within the member Ministries. To coordinate the approval procedures and information requirements of various government agencies with the planning efforts of development proponents, the Environment and Land Use Committee has published Guidelines for Linear Development and Guidelines for Coal Development.

The Environment and Land Use Act is the most broadly applicable provincial statute pertaining to natural resource use. The Act does not always provide direct controls over resource use as does, for example, the Land Act or Water Act. However, under circumstances where such statutes cannot be applied for a specifically required purpose, the provisions of the Environment and Land Use Act can be applied. An example of such a circumstance is the establishment of a mandatory environmental impact assessment requirement for all proposed developments within the Cowichan estuary and the Fraser River estuary.

The Land Act applies to public or Crown land with the exception of federally controlled land, land under a Forest or Park Reserve, or land otherwise specifically exempted from jurisdiction. The Act enables the Ministry of Lands, Parks and Housing to reserve, allocate, lease and grant Crown land for specific purposes.

Under the Land Act, the Ministry of Lands, Parks and Housing administers the regulations and procedures for obtaining rights to Crown Land.

The Ministry maintains an extensive referral system to solicit the concerns and recommendations of federal, provincial, regional and local government agencies for each Crown land use application. The Ministry uses such input as a basis for setting the conditions it requires for granting leases or other forms of tenure. The Ministry's jurisdiction in the Squamish estuary is limited to the Crown land and foreshore in Mamquam Channel, the Squamish River channel and an isolated parcel in the East Delta.

The Ecological Reserves Act recognizes that it is in the public interest to set aside areas of Crown land representative of distinctive ecosystems for present and future scientific study, and provides for implementing arrangements for that purpose.

The majority of the Squamish estuary is owned by British Columbia Railway, a Crown corporation responsible to the Minister of Industry and Small Business Development. As an intra-provincial railway, British Columbia Railway's operations are subject to regulation under the B.C. Railway Act administered by the Ministry of Transportation and Highways. The corporation was established under the British Columbia Railway Incorporation Act and can acquire land for the purposes of serving its long-term needs. However, apart from payment of taxes, British Columbia Railway does not possess any special status and is subject to the same laws as any private property owner. For the portion of its holdings in the Squamish estuary which are ancillary to its foreseeable operational requirements, British

Columbia Railway is interested in receiving a reasonable return on its investment. In this regard, the Corporation has leased or sold certain portions of its holdings in the estuary.

The Water Act governs the use of water in British Columbia which includes natural sources of surface water, lakes, streams and groundwater. Under the Act, the Province retains all rights to water except where the right to its use is granted by a water licence issued by the Water Management Branch, Ministry of Environment. A licence is issued for a particular purpose, from a particular source and, where applicable, for a specified quantity.

Under the Water Act, a water licence is required for water uses ranging from domestic water supply to large scale dams. All water licence applications are advertised and objectors qualified under the Act have an opportunity to intervene in writing or, when applicable, at a public hearing. The Water Management Branch uses such input along with its own information to set the conditions under which a water licence is granted or denied.

The principle means by which the provincial government controls the pollution of water, air and land is provided under the Waste Management Act, which superceded the Pollution Control Act. The Act requires that activities involving the discharge of sewage or other waste material and contaminants to land, water, or the atmosphere cannot proceed without a permit or approval from the Waste Management Branch, Ministry of Environment.

Under the Act, the Waste Management Branch can determine what constitutes a polluted condition of water, land or air and prescribe standards governing the limits for discharge of various types of emissions and effluents. The Branch also conducts tests and surveys to determine the extent of pollution, examines existing and proposed means for disposal of sewage and contaminants and approves plans for such undertakings. The Waste Management Act provides for the determination of appropriate terms and conditions for the issuance of pollution control permits and the monitoring of discharges to ensure compliance with permits and approvals. It also requires municipalities to develop a waste management plan detailing how wastes are to be handled for approval by the Minister of Environment.

The Waste Management Act differs from its predecessor in that the power to issue permits is transferred from the Director to the Regional Managers. The regulations of the Act specify procedures for acquiring permits. Permit applications must be advertised to the public. Objectors qualified under the Act may register their objections to the granting of a permit with the Waste Management Branch. The Branch also maintains a referral system to obtain comments and recommendations from other government agencies. Information obtained from such sources is then used to determine whether a permit will be granted and, if granted, what conditions will be applied. A decision to grant a permit and provisions of a permit can be appealed to the Environmental Appeal Board.

Pollution Control Objectives were developed under the former Pollution Control Board through a public inquiry process. The Objectives, used by the Waste Management Branch to set permit limits for discharges, have been developed for the forest products industry, municipal type waste discharges, the chemical and petroleum industries, mining, mine-milling, and smelting industries, and food processing, agriculturally oriented and other miscellaneous industries.

The Pesticide Control Branch regulates the sale, use, transport, storage and disposal of pesticides within British Columbia under authority of the Pesticide Control Act. This includes the licencing of vendors and applicators, the training, examination and certification of personnel engaged in sales and application, issuing permits for the use of pesticides, investigating incidents of suspected pesticide misuse and public information.

Although it primarily addresses the provision and control of health services in the Province, the Health Act also regulates sewage disposal systems discharging less than 22.7 m^3 per day. The construction and maintenance of all such sewage disposal systems must receive the prior approval of the Ministry of Health. Administering the procedures for obtaining necessary approvals, ensuring the proper location, design and construction of sewage disposal systems and monitoring the effectiveness of such systems are tasks usually carried out by local Health Units in accordance with regulations under the Health Act.

The Wildlife Act (B.C.) establishes provincial proprietary jurisdiction over all wildlife which is resident or migratory within provincial boundaries, and over non-migratory game fish in non-tidal waters. The Act, which is administered by the Fish and Wildlife Branch, Ministry of Environment, sets out provisions for conducting research into all aspects of the habitat and ecology of fish and wildlife species, establishing wildlife sanctuaries, developing game management regulations and practices, and the issuing and enforcement of hunting permits and angling licences.

The Fish and Wildlife Branch maintains communication with various federal, provincial and local government agencies through numerous referral systems, government committees and task forces. Through such processes, the Branch provides comments and recommendations concerning all types of resource use activities and planning in an effort to promote the conservation and management of fish and wildlife resources. In this regard, the Fish and Wildlife Branch often pursues the implementation of their resource management objectives through other provincial statutes providing more direct control over land and water use (eg., Land Act, Forest Act, Water Act).

The Land Title Act, administered by the Registrar of Titles, Ministry of the Attorney General, outlines the procedures and specifications required for the subdivision of lands and their registration. Flood protection is also facilitated under this statute. Where land within a subdivision plan is, or may be, subject to flooding, the prior consent of the Ministry of

Environment is required before the subdivision plan can be approved. Under the Land Title Act, approving officers submit subdivision plans for areas deemed subject to flooding to the Water Management Branch, Ministry of Environment. The Branch establishes requirements for each subdivision plan relating to the siting and elevation of all habitable structures in order to assist in the prevention of flood damage. The Water Management Branch also prepares floodplain plans for certain areas of the Province.

Provincial jurisdiction also extends to the construction and use of dykes. The Dykes Maintenance Act established the office of the Inspector of Dykes under the Ministry of Environment. The Act enables the Inspector to approve the construction of dykes and all works constructed in, around or through dykes. The Inspector of Dykes is advised of such activities through various referral systems and encourages early consultation with proponents of developments which could affect the use and safety of dykes.

The Environment Management Act is intended to enable the Ministry of Environment to establish a positive approach to environmental management and to streamline the process through which environmental and developmental decisions are made. The basic elements of the Act include provisions to develop management plans and environmental guidelines, to acquire information relative to environmental impact and protection and to take action to prevent environmental damage.

The provincial government operates a referral system in each of the eight regions of the Province through Regional Resource Management Committees. Each Regional Resource Management Committee is comprised of a representative from each Ministry with regional operations. These Committees meet as necessary to discuss proposed developments.

C.3 Municipal and Regional

The Municipal Act provides the authority for local governments to prepare land use plans and implement them through zoning and subdivision by-laws and development permits. The Act provides for three types of land use plans: Official Regional Plans, Official Settlement Plans and Official Community Plans.

An Official Regional Plan is a conceptual plan establishing broad objectives and policies for the development of a regional district or a major sub-area of it. There is not yet an Official Regional Plan for the Squamish-Lillooet Regional District.

An Official Settlement Plan is a comprehensive land use plan, more detailed in content than an Official Regional Plan, and which establishes land use policies for areas of the regional district that are unincorporated. There are no Official Settlement Plans in the Squamish estuary area.

An Official Community Plan is a comprehensive land use plan similar to an Official Settlement Plan, establishing land use policies for a municipality. The District of Squamish has not adopted an Official Community Plan. Land use within the district's boundaries is regulated under the provisions of Zoning By-Law #277 and its amendments. However, the District of Squamish is in the process of finalizing a community plan which will take future community developments into account.

Zoning and subdivision by-laws are the tools by which official plans are implemented. Zoning by-laws are designed to regulate the location and use of buildings and structures, and the use of land, including water body surfaces within a municipality or regional district as specified under the Municipal Act. Regional and local governments also have the authority to prepare subdivision regulations which will control the subdivision of land and establish standards for utilities, works or services to be provided at subdivision under the provisions of the Municipal Act and the Land Title Act. Regional district and village by-laws require the approval of the Minister of Municipal Affairs.

Under a zoning by-law or through an amendment to an existing zoning by-law, local government also may provide for the issuance of development permits. Development permits are used where special conditions prevail in the physical environment or when special design and siting instructions are required. Development permits cannot vary the permitted uses or densities of land use specified under the applicable zoning by-law.

Further information on government jurisdiction is contained in Literature Listed at the end of this Appendix.

C.4 Partial List of Permits and Approvals

The following list is provided to indicate the government permits and approvals required in order to undertake certain activities within the Squamish estuary. The list is by no means comprehensive. Rather, it is a representative sampling of general activities frequently proposed in coastal areas like to Squamish estuary. It should be noted that for each of the activities listed, not all of the specific requirements for approval of a particular proposed activity are listed.

ACTIVITY	APPROVAL/PERMIT	AGENCY
foreshore landfill (site development)	lease tenure-for Crown foreshore	B.C. Ministry of Lands, Parks and Housing; Regional Manager, Lower Mainland Region, 4240 Manor Street, Burnaby, B.C., 438-5344
	lease tenure-for private foreshore (BC Railway is	British Columbia Railway Co., P.O. Box 8770 Vancouver, B.C. 681-3131
	approval under *Navigable Waters Protection Act*	Transport Canada; Aids and Waterways, NWPA Senior Officer, P.O. Box 1060, 700 W. Georgia St., Vancouver, B.C., 666-1109
	approval under *Fisheries Act*	Fisheries and Oceans Canada; Habitat Protection, Water Use Unit, 3rd Floor, 1090 W. Pender St., Vancouver, B.C., 666-3545 or Local Fisheries Officer, P.O. Box 85, Squamish, B.C., 892-5217
	development permit	District of Squamish; Municipal Administrator, P.O. Box 310, Squamish, B.C., 892-5217
	(if potentially affecting flooding or erosion)	B.C. Ministry of Environment; Water Management Branch, Lower Mainland Region, 15326-103A Ave., Surrey, B.C., 584-8822
dredging	lease/licence of occupation	B.C. Ministry of Lands, Parks and Housing or British Columbia Railway
	approval under *Navigable Waters Protection Act*	Transport Canada
	approval under *Fisheries Act*	Fisheries and Oceans Canada
	approval by land owner	B.C. Railway Co., or other owner

ACTIVITY	APPROVAL/PERMIT	AGENCY
dredgate disposal (marine)	approval under Ocean Dumping Control Act	Environment Canada; Environmental Protection Service, Kapilano 100, Park Royal, West Vancouver, B.C., 666-6711
dredgate disposal (land-based)	conformity with zoning/ landowner's permission	District of Squamish and specific landowner
docks, wharves, etc.	lease tenure	B.C. Ministry of Lands, Parks and Housing or British Columbia Railway
	approval under Navigable Waters Protection Act	Transport Canada
	approval under Fisheries Act	Fisheries and Oceans Canada
	development permit	District of Squamish
log handling operations (dumping, storage, sorting, processing, etc.)	refer to permits and approvals listed for docks wharves, etc.	see above
sewage disposal (over 22.7 m^3)	pollution control permit	B.C. Ministry of Environment; Waste Management Branch, Lower Mainland Region, 15326-103A. Ave., Surrey, B.C. 584-8822
	approval under Fisheries Act	Environmental Protection Service, Kapilano 100, Park Royal, West Vancouver, B.C., 666-6711
	development permit	District of Squamish
sewage dispsoal (under 22.7 m^3)	sewage disposal permit	Ministry of Health; Coast/ Garibaldi Health Unit, Box 130, Squamish, B.C., 892-3585
	development permit	District of Squamish
industrial effluent discharge	pollution control permit	B.C. Ministry of Environment; Waste Management Branch

ACTIVITY	APPROVAL/PERMIT	AGENCY
	approval under Fisheries Act	Environmental Protection Service, Kapilano 100, Park Royal, West Vancouver, B.C., 666-6711
	water licence (for water intake)	B.C. Ministry of Environment; Water Management Branch, Lower Mainland Region, 15326-103A Ave., Surrey, B.C., 584-8822
	development permit	District of Squamish
land-based waste disposal	pollution control permit	B.C. Ministry of Environment; Waste Management Branch
	approval under Fisheries Act	Environmental Protection Service, Kapilano 100, Park Royal, West Vancouver, B.C., 666-6711
	conformity with zoning/ development permit	District of Squamish
	landowner's permission	specific landowner
subdivision	subdivision plan approval/development permit	District of Squamish; Municipal Approving Officer
	(if near controlled access highway)	B.C. Ministry of Transportation and Highways; Regional Approving Officer, 7818 6th St., Burnaby, B.C., 525-0961
	(if land is subject to flooding)	B.C. Ministry of Environment; Water Management Branch, 2nd Floor, 737 Courtney St., Victoria, B.C., 387-5777
	land title registration	Ministry of the Attorney General; Registrar of Titles, Land Titles Office, 800 Hornby St., Vancouver, B.C. 668-2595

ACTIVITY	APPROVAL/PERMIT	AGENCY
	approval under *Fisheries Act* where fish habitat affected	Fisheries and Oceans Canada; Habitat Protection, 1090 West Pender St., Vancouver, B.C., 666-3545

Ince, J.G.; 1977; *Land Use Law : A Study of Legislation Governing Land Use in British Columbia*; Continuing Legal Education Society of British Columbia, Centre for Continuing Education, University of British Columbia.

______; 1976; *Environmental Law : A Study of Legislation Affecting the Environment of British Columbia*; West Coast Environmental Law Association, Publ. by Centre for Continuing Education, University of British Columbia.

The Coastal Zone Resource Subcommittee; 1978; *The Management of Coastal Resources in British Columbia : A Review of Selected Information*; Environment Canada, Lands Directorate, Vancouver.

Marine, Brackish, and Freshwater Areas

Sources of fresh and salt water are the fundamental determinants of the distribution of fresh, brackish, and marine water areas in the estuary. The Squamish River and its two main tributaries, the Cheakamus and the Mamquam, provide the main input of freshwater into the study area. The Strait of Georgia is the source of salt water. Despite variations in salinity distribution by a number of factors, it is possible to identify areas on the Squamish delta influenced more by freshwater than are others. Generally, areas near the river mouth and shallow areas are more fresh than deeper sites. Because freshwater input is restricted to the west side of the delta by the training dyke, water of the West Delta is less saline than that of the Central and East Deltas and Mamquam Channel. The training dyke culverts allow a freshwater lens to develop in the Central Basin during high flows, but this lens does not penetrate to the seaward edge of the Basin. Under high flow conditions, salt water had been detected 3 km up the Central Basin and 2 km up Mamquam Channel. A more detailed study of salinity distribution undertaken during low (March) and high (June) flow periods would be beneficial.

Plant Associations and Primary Productivity Indices

Benthic algal species diversity and annual net productivity on the Squamish River delta have been noted to be greatest east of the training dyke because of the more stable, higher salinity habitat than that of the

West Delta. Production, distribution, and diversity of benthic algae are greatest in late winter and early spring when increasing light intensity, loss of marsh vegetation, higher salinity, and lower sedimentation rates contribute to optimal conditions for colonization and growth. Algae are immediately available as a food source, as well as providing cover at low tide for benthic invertebrates. In addition, organic removal data has shown that benthic algae provide a constant source of organic material in the estuary.

A survey of marsh communities has indicated that members of the sedge family (Carex spp.) are the dominant intertidal plants on the delta. Studies indicate that the net production of Carex spp. on the Central and East Deltas are among the highest reported in the literature.

It has been noted that changes in upland vegetation of the estuary could be associated with elevation above high water, proceeding through a continuum of reed grass, deciduous shrub thickets, Sitka spruce/cottonwood, to a Sitka spruce/broadleaf maple association. Approximately 96% of the annual net primary productivity on the delta has been attributed to Carex spp. while benthic algae is responsible for 4%. Carex spp. must be changed by decomposition into detritus before it is generally available to consumers. Therefore, it has been suggested that benthic algae are important to the estuary because they are readily available for consumption, they supply energy for specialized consumers, they are a possible requirement in the diet of some invertebrates, they are an auxiliary source of detritus when the breakdown of Carex spp. is lowest, and they utilize nutrients regenerated from existing sediments and detritus. The Squamish estuary is a detritus-based removal system with most of the energy input and storage attributable to vascular plants of the tidal marshes.

Studies of the benthic algae and marsh vegetation of the Mamquam Delta should be undertaken. Marsh vegetation of the Central and Mamquam Deltas should be more completely mapped. Below-ground energy flow and the fate of removed organics should be considered in detail through studies of vegetation community functions on the delta.

Benthic Invertebrate Populations

Distribution and abundance of intertidal benthic invertebrates is primarily a function of salinity regime and distance from the river, and secondarily of elevation and substrate type. Freshwater and estuarine invertebrates were abundant in higher stations on the West and Central Deltas. In areas subject to high salinities such as the Mamquam Delta and front of the Central Delta, estuarine and marine organisms were abundant. It has been noted that both diversity and abundance varies with habitat. There were seasonal and spatial differences in the types of organisms collected in horizontal plankton tows and the presence of invertebrates in these tows was related to river runoff. Marine plankton has been noted to penetrate the Central Basin and Mamquam Channel during winter when freshwater was not widespread.

Eogammarus confervicolus (Amphipoda) are most abundant under sedge rhizomes or algal material, but are widely distributed over the delta. It has been suggested that construction of the training dyke has reduced flushing of amphipods from the central area of the estuary and is, therefore, responsible for their relatively high abundance in this area. Laboratory experiments show growth rates of amphipods are greatest on a diet of benthic algae under conditions simulating spring on the Central Delta, and summer on the Mamquam Delta. Growth rates are lowest under conditions simulating winter on the West Delta. These data emphasize the importance of the Central Delta for invertebrate production. Several species of subtidal invertebrates have been observed on the delta front. These include crab, shrimp, nudibranch, and anemone.

The long term effects of the training wall on the marshes of the central area should be closely monitored. Increased salinity may have a detrimental effect on the Carex spp. of this area. Information on generation time and longevity of Eogammarus confervicolus would be of value in examining how this species is exploited by juvenile salmonids. Studies of freshwater invertebrates inhabiting the river channel between the culverts and the northern boundary of the study area should be undertaken. More detailed studies should be made of the subtidal invertebrates of the delta front.

Factors Affecting the Substrate

It has been observed that sedges have acted to trap silts and clays carried by the river with the results that sediments in tidal marshes are dominated by silty-clay faeces. Sediment deposition and distribution on the West Delta shows coarser sediments than those of the Central Delta. This is possibly a result of the West Delta being subject to greater river flows and the protection of the Central Delta by the training wall which blocks waves during strong southerly winds.

Differences in salinity regimes may also account for the variation in sediment coarseness. The delta front is covered by sandy-silty faeces. The confinement of river flow has resulted in rapid accretion on the West Delta front while the East and Central Delta fronts are showing signs of erosion.

The Fisheries Resource

The Squamish River system supports four species of Pacific salmon; chum, chinook, coho, and pink. It is estimated that the present salmon resource of the Squamish River totals 572,377 fish. Of this total, 198,093 spawners produce an annual commercial catch of 266,030 fish, a sport catch of 104,369 fish and an Indian food fishery catch of 3,885 fish. This resource represents an annual commercial wholesale net value (gross wholesale value minus harvesting and processing costs, 1978 prices) of $2.3 million.

The Squamish also supports a major sport fishery primarily centered on steelhead (and salmon), but which also includes cutthroat trout and Dolly Varden char. The Squamish steelhead fishery is considered one of the finest in the Lower Mainland area and one of the better fisheries in the entire province. An angler effort (based on a five-year average) of 6,343 days/-year is expended on a total run of 1,943 fish, of which 487 are caught and killed, and 549 caught and released. Escapement of steelhead to the spawning grounds averages 1,456 fish per year. The social and economic aspects of the Squamish sport fishery is emphasized by the close proximity of the Greater Vancouver populace. Alteration or loss of habitat could have profound effects on fish populations and, in turn, on a large and important sport fishery.

Habitat Utilization By Fish Stocks

The fish species of the Squamish estuary have been divided into two groups: permanent and temporary residents. There are five known species of permanent residents and twelve temporaries.

It has been indicated that the Central Basin is the most favourable habitat for juvenile salmonids. The smallest catches of salmon were taken in Mamquam Channel on the east side of Squamish Terminals' fill area. However, 99% of herring were caught on the east side of Squamish Terminals. Most salmonid species appear to be seasonally abundant in the estuary coinciding with both juvenile and adult migration periods.

Amphipods and mysids appear to be the major food sources of juvenile salmon, herring, sculpins, and starry flounders which are captured in the estuary. Other estuarine benthic invertebrates and some insects also serve as food for juvenile salmon and herring. Fish in the outer estuary were found to utilize two separate food sources; marine plankton, and an amphipod/insect complex dependent on algal and sedge production on the delta. The change in food source, which occurs from April to June, is felt to be due to the decrease in phytoplankton production brought on by the freshet.

Several projects are underway or are being considered for the enhancement of steelhead and salmon stocks. These include fry introductions, a hatchery, and pre-smolt releases.

Some particular areas that should be further investigated are:

1. Residence time, distribution, enumeration, age class structure, diet preferences, and acclimation of salmonids in the estuary.
2. A comprehensive list and biology of all species in the estuary.
3. Use of the estuary by juvenile steelhead, cutthroat, and Dolly Varden which have been displaced from areas where carrying capacity has been exceeded.
4. The function of staghorn sculpins in the estuary, particularly their predation on juvenile salmonids.
5. Possible impacts of environmental change on the salmon runs.

Habitat Utilization By Wildlife Populations

Visiting and resident wildlife species are known, but abundance and habitat utilization within the study area are not well understood. Of the marine mammals, harbour seals and killer whales are regular visitors to the estuary. Eight species of furbearers are known to be present in the study area and other species are suspected to occur. Furbearers are likely to be distributed throughout the study area wherever there is suitable habitat. Big game animals utilizing the study area include Columbian blacktail deer, black bear, and cougar. Thirty-four non-game wildlife species in the Orders of shrews, bats, rodents, and rabbits/hares are believed to inhabit the area.

Species lists suggest that a potential 187 bird species use the Squamish estuary and adjacent water and upland areas. Waterbirds, shorebirds, raptors, songbirds, and upland game birds are the major groups inhabiting the study area. Vegetated foreshore is an important habitat requirement of waterbirds. Vegetation may be eaten directly by birds or may contribute to their food supply indirectly through the detrital food chain. Intertidal and shallow subtidal vegetation may be used as a substrate for herring spawn, which is eaten, along with the fish themselves, by certain species of migratory birds. A number of species (notably a large concentration of bald eagles) depend for food seasonally on spawned-out salmon and salmon eggs within the study area. Water depth is also an important habitat requirement. Generally, the greater the area of intertidal zone and adjacent subtidal zone, the better the habitat for waterfowl.

Many aspects of habitat utilization by the wildlife of the study area are poorly understood. Studies to develop accurate species enumeration and periods of abundance, as well as an understanding of the relationships between habitat units and the wildlife species which use them, should be undertaken.

Areas Formally Designated or Proposed For Fish and/or Wildlife Protection

1. A 10.5 hectare municipal reserve to the School Board adjacent to the high school is currently used as a nature study area.

2. The Department of Fisheries and Oceans has recommended that all areas of the estuary be protected for conservation except for those areas which do not contribute significantly to estuarine productivity. These areas have been defined as:
   - that portion of the Mamquam Channel northeasterly of the public docking site,
   - all areas enclosed by flood control dykes,
   - where dykes are not present, all areas above extreme high tide mark and separated from this demarcation by an adequate site- specific green-belt area,

- shoreline areas on both east and west sides of Howe Sound south of the Squamish River delta.

3. The District of Squamish and Squamish Chamber of Commerce have prepared a brief recommending that areas of the estuary west of the B.C. Rail line serving Squamish Terminals be considered for conservation.

4. The Squamish Estuary Nature Centre *ad hoc* Committee has prepared a brief recommending a nature centre be located on the Central and East Deltas.

Land Use Effects on Aquatic and Terrestial Habitats

There are four main areas of modification of aquatic habitats in the study area: dykes and training wall, fill and reclamation, dredging, and log storage. Direct alienation, bank modification, salinity and sediment changes, substrate scouring or smothering, and shading are potential effects of these land use activities on aquatic habitats.

Terrestial habitats can be affected detrimentally through general urbanization, the pursuit of recreation, and agriculture. Alienation of habitat, undue disturbance, and competition with domestic animals are potential effects of these land use practices.

There can also be beneficial effects for opportunistic species brought about through land development. Roosting and resting habitat can be created, additional food sources made available, and agricultural activity can contribute food directly and indirectly as well as provide habitat for some species. Beneficial effects are also the planned result of reserve and conservation areas.

D.3 Air and Water Quality Work Group

This report summarizes available data on air and water quality, as well as information on the accumulation of toxicants in sediments and biota. Sections are also included on meterology, river hydrology, estuarine circulation and air emissions, liquid effluents, and solid wastes which enter the study area. Recommendations in the report deal with monitoring programs, remedial programs which should be undertaken and guidelines for future activities.

Ambient Air Quality

The estuary usually experiences a maritime climate although wind and temperature regime tend to be accentuated compared to coastal regions, since Squamish is located further inland, at the head of Howe Sound. It has been recognized that the local topography of the Howe Sound area makes air pollution potential in the southwest coast region an item for concern.

Hydrology

The main tributaries of the Squamish River are the Elaho, Cheakamus and Mamquam Rivers. The Mamquam River has been a tributary only since the early 1920's when its flow was re directed by flood control measures from Mamquam Blind Channel to the Squamish River.

The dykes constructed along the Squamish River are likely to provide protection from flooding from most peak floods. Flooding which occurred during 1980 did not result from failure of the dyke system, but from water backing up along a creek.

The purpose of the training dyke along the southern portion of the Squamish River was to prevent fanning of the delta to the east. Since the delta was advancing at a steady rate, its growth was extending towards the port facilities and the proposed harbour. This has been apparent in the upper, middle, and lower estuary sections.

The District of Squamish, in the period from 1972 to 1978, used an average of 7700 m^3/d of water, or a maximum of only 5% of the Stawamus River mean monthly flow. Water shortages are not anticipated with the present growth demands. Industry consumes approximately 5% of the average daily water distributed by the District of Squamish.

Air Emissions, Liquid Effluents, and Solid Wastes

The wind patterns in the Squamish area make air pollution from Woodfibre of importance to Squamish residents. The odour problem noted at Squamish would be less severe if permitted values for bivalent sulphur compounds were met at Woodfibre.

FMC of Canada Ltd. has taken extensive steps to upgrade discharges from its operation. The abandoned settling pond is currently being upgraded by confining mercury contaminated sludge to a restricted area which has been covered with an impermeable membrane. Significant amounts of mercury lost which cannot be accounted for in the process are the subject of discussions between government agencies and FMC. Although high mercury levels have been recorded in sediment samples, it is believed that these have resulted largely from discharges from FMC prior to 1972.

CanadianOxy (Hooker) Chemicals have met permitted limits for air emissions and pH limits specified in their pollution control permit for the disposal of brine sludge. Leachate from the brine sludge landfill may enter a ditch draining to Cattermole Creek.

Oil levels in effluent from Squamish Terminals have exceeded the limit specified in its pollution control permit for 45% of the limited data. Evidence of the effluent from the rock seepage pit was noted in the intertidal zone. Analyses of sediments adjacent to the wood preservation dip tanks indicated high levels of pentachlorophenol and tetrachlorophenol.

Both the Central STP and the Mamquam STP experience excessive BOD_5 and suspended solids concentrations due to high flows through the treatment plants. These high flows render the treatment process useless at those times. Samples collected by the District of Squamish for bacteriological analyses have not been collected in bottles containing sodium thiosulphate, negating the accuracy of these bacteriological data.

The effluent discharge point from the Mamquam STP into the Squamish River frequently provides no dilution to the effluent. This undiluted discharge is a potential public health and fisheries hazard. This discharge persisted even after the District of Squamish had taken steps to dredge the river and provide adequate dilution. The placement of this discharge as a submerged outfall in the Squamish River would provide more adequate dilution, and thus reduce potential ammonia toxicity associated with this effluent. The need for chlorination and dechlorination should be reviewed.

The municipal solid waste disposal site operated by the District of Squamish up until June, 1980, was closed due to high groundwater levels in the area. The District of Squamish has adequately covered dump faces. Methane generation at this site will be in proportion to the operating life of the site.

Hazardous Chemicals

Considerable quantities of bulk chemicals are handled by the chemical and forestry industry operations in Squamish each year. Although both industries are responsible for importing bulk chemicals, only the former serves as a net producer and exporter of chemical products. Approximately 6000 tonnes of chemicals are imported annually while approximately 143000 tonnes are exported (details regarding types of chemicals, quantities handled and methods of shipping are provided in Table 15 of the Air and Water Quality Work Group Final Report). At the municipal level, a contingency plan exists which would deal with chemical spills or other disasters. In general, the plan coordinates local activities which include fire, police, municipal engineering services, Ministry of Highways equipment services and additional local resources such as hospital and health care facilities and communication services through emergency broadcasting. At the provincial level, the Provincial Emergency Program would be available to coordinate or oversee any emergency procedures and supply additional resources as needed.

Riverine Water Quality

Most water chemistry parameters in the Stawamus, Cheakamus, Mamquam and the Squamish Rivers excluding copper, zinc, and manganese met the water quality criteria for the propagation and maintenance of aquatic life. It has not been established whether copper, zinc, and manganese pose a threat to aquatic resources. The median reported values for most parameters were equal to, or lower than, the median values reported for all monitored B.C. streams. Dissolved oxygen concentrations were higher. The influence of freshet is to decrease alkalinity, hardness, and magnesium, and to increase phosphorus and suspended solids. These increases result from the erosion of bank material and the resuspension of sediments. Sampling undertaken by government agencies has typically coincided with freshet, resulting in a paucity of data related to low flow conditions.

Riverine waters are poorly buffered against alkaline discharges. Saline waters at depth in the Squamish River and Cattermole Creek are much better buffered against both alkaline and acidic discharges, than surface waters at the same locations.

Theoretical calculations indicated that ammonia toxicity will not likely be a problem in the Squamish River. Ammonia toxicity will only become a problem should temperature and/or alkalinity be elevated simultaneously. This is unlikely under present conditions.

Estuarine Water Quality

The Squamish River and the inner portion of Howe Sound represent a classic fjord-estuarine system in that there is a major freshwater input at the head of a long, narrow and deep channel. In such a system, the freshwater from the river moves into the channel, spreading out as a thin layer overriding the denser seawater below. Some upward mixing occurs at the freshwater-seawater interface, salt water thus becoming entrained into the freshwater as it is carried seaward. There is a rapid density increase with depth generated essentially by salinity, between the less dense fresh or brackish surface layer, and the underlying high salinity water. Salt water so removed must be balanced by a compensating inflow at depth. The estuarine cirulation, essentially seaward at the surface and landwater at depth, is influenced by winds, tide, and a sill which forms a basin.

The estuary east of the training dyke has changed from a brackish to a more marine condition due to the almost complete elimination of riverine water flow to the central basin. Mamquam Blind Channel is relatively well mixed, with a freshwater lens developing at high tide. Higher water temperatures have been recorded in the winter in the central basin and in the east delta, than in the Squamish River or the west delta. The higher temperatures can potentially influence the nature of aquatic communities.

There have not been any areas of consistent oxygen depletion reported in the study area. Low dissolved oxygen values were recorded infrequently in Howe Sound, at depths from 200 to 250 metres, north of the sill, in the autumn of 1977 and 1978. This may be a regular occurrence in Howe Sound.

Sediment Quality

There is a marked decrease in the content of metals in sediments as the grain size increases. The grain size of sediments and the carbon content have a covariant relationship. Organic matter is believed to be the most important factor in controlling mercury levels in sediments. The ability of sediments to complex and retain metals in non-biologically available forms is important when determining dredging effects and dredge spoil disposal methods.

Sediments in Cattermole Creek are better sorted than in Mamquam Blind Channel due to the level of man-induced activities adjacent to the channel. Sediments in Mamquam Blind Channel are poorly stored, although areas such as the mouth of the Stawamus River which are influenced by natural phenomena, are better sorted. Wood fibre in the sediments of Mamquam Blind Channel are influenced by log handling. Many of the samples were darkly coloured, and odorous. The presence of the wood fibre resulted in higher total organic carbon levels in the Mamquam Blind Channel sediments, than in those from Cattermole Creek.

Extremely high levels of pentachloropohenol and tetrachlorophenol have been reported in sediments adjacent to the wood preservation facility at the Weldwood of Canada Empire Lumber operation. A fish kill attributed to these phenolic compounds has occurred in Mamquam Blind Channel.

Mercury levels in Squamish estuary sediments are elevated adjacent to the FMC chlor-alkali plant. In general, most mercury released to the water in dredging operations quickly recombines with the sediment. For the Squamish estuary, the period based upon laboratory tests was estimated to be 24 hours. Dredging does cause mercury-contaminated sediments to be spread over a larger area. Mercury levels in sediments were comparable between 1972 and 1976.

Toxicant Accumulation in Biota

The spiny dogfish (Squalus acanthias) is the only fish species which has consistently exceeded the recommended health standard for mercury. High mercury levels are common in dogfish in coastal waters of southern British Columbia. However, individuals of rockfish, lingcod, and flounders have been occasionally found to contain high mercury levels. Mercury levels in dungeness crabs (Cancer magister) have decreased from extremely high values reported in 1970 and are approaching "natural" levels.

D.4 Recreation Work Group

Existing Recreation Uses

Although only a fraction of the estuary is actually used by recreationists, large areas are critical in the food chain and habitat of fish and bird life that are themselves the object of various recreational pursuits.

The salmon sports fishery in the Howe Sound Region, for example, is a multimillion dollar enterprise dependent upon the estuary, while bald eagle concentrations, also dependent on the salmon, are of international significance.

Nature observation, hunting, angling, shallow-draft boating and walking are popular activities in and around the estuary. Camping also takes place in conjunction with fishing in the Squamish River. Recreational boating facilities are confined to those made available by the Squamish Yacht Club, which currently operates at capacity.

Potential Recreational Activities

Improved access and information for the public would increase the volume and diversity of uses, attracting picnickers, sightseers, nature enthusiasts, small boaters and a variety of organized groups from both the District and the Region.

Tourism

The town of Squamish is not and will not likely become a major focus for tourism or regional recreation. The river and estuary are attractive and well used by groups and individuals having a particular interest in fishing and interpretation. Additional use could be made of the area by more locals and non-residents if certain improvements were made.

Recommendations

There are several projects which should be undertaken to improve public information and accessibility and to give the estuary a higher profile:

a. Riverside Camping: Consolidate and formalize camping in a campground located near the Squamish/Mamquam confluence, to be operated by the municipality or its agent.

b. Estuary - Public Access: At least three sites for proper public access should be developed: one for foot traffic along the Squamish River and down the training dyke; another would allow vehicular access and a cartop boat launch at the K & R logging dump; a third would permit foot access from the Royal Hudson train along an interpretive walk off Vancouver Street. Parking, toilets, garbage receptacles and informational signing would be provided.

c. Industrial Interpretation: Considerable potential exists for industry to undertake a program of landscaping, tours, public access and interpretative opportunities. This is particularly apparent in the Mamquam Channel where civic initiatives could develop an attractive waterfront/ commercial development that would capitalize on the proximity of industrial activities and the waterfront itself as a public attraction.

Appendix E

APPENDIX E: PROPOSED ACTIONS AND STUDIES

E.1 Introduction

This is a summary of the recommendations of the Technical Work Groups. It includes suggested actions, assessments, studies, guidelines, rehabilitation and enhancement projects, and monitoring projects. Extensive information on the Squamish estuary has been collected in the Technical Work Group Reports which are summarized in Appendix D. However, much of the information is too general to form the basis for particular land and water use decisions. The collection of information to fill data gaps and to address site-specific concerns will contribute to effective plan implementation through providing a basis for greater certainty in decision-making.

The following summary, by outlining the rationale, the estimated duration and the estimated cost of each proposed action to study, will serve as a guide to major findings of the Technical Work Groups. The Coordinating Committee, in implementing the Management Plan, will determine which of the recommendations are of highest priority for estuary management purposes. Of primary concern should be those actions and studies which fall into the following categories:

1. Recommendations referred to in Section 3.0 regarding policy guidelines and area designation.

2. Enhancement/rehabilitation projects to upgrade conservation areas and other estuary improvements (Section 4.0).
3. Studies which will upgrade biophysical inventory and ecological information for the estuary (Section 4.0).
4. Studies which provide information needed in order to assess specific development proposals.

The Coordinating Committee may make recommendations on agencies' interests, and coordinate activities for carrying out these actions and studies.

The recommendations are categorized under the same headings as the Technical Work Groups, although certain studies may not be the recommendation of a particular work group. It should be noted that the estimated costs and duration associated with each recommendation are rough approximations which can be made more accurate when the details of each recommendation are determined. These estimates are intended to indicate the implications of the recommendations in terms of time, resources and commitment.

The following information is given for each recommendation, although the format has been simplified for some straight forward recommendations.

Project Title -

Location of Area to Which the Recommendation Pertains -

Rationale -

Description -

Estimated Cost and Duration -

Those recommendations which are site-specific are shown in Figure 6.

E.2 Air and Water Quality

The recommendations regarding air and water quality are divided into two types: actions which would upgrade existing facilities, and recommended studies.

Recommendations Regarding Existing Facilities

E.2.1 Sewage Treatment Plants

Location: Mamquam Sewage Treatment Plant - confluence of Mamquam and Squamish Rivers (Figure 6, #1).
Central Sewage Treatment Plant - East Delta.

Rationale: The Air and Water Quality Work Group has analyzed the performance and impact of the Central Sewage Treatment Plant and the Mamquam Sewage Treatment Plant. This investigation has indicated that there is a need for improved plant performance and effluent quality.

Description: As recommended by the Work Group, the following actions should be taken by the District of Squamish to achieve this objective.

i. Both the Central STP and the Mamquam STP experience excessive BOD_5 and suspended solids concentrations due to high flows through the treatment plants. These high flows render the treatment process useless at those times. Flow equalization facilities should be considered at both sewage treatment plants to improve plant performance and effluent quality. The facilities should be constructed only after an engineering study of the requirements at each plant is undertaken. As part of this program, an evaluation of the present flow metering equipment should be undertaken to assess the need for more accurate flow recording (see Section 4.2).

ii. The effluent discharge point from the Mamquam STP into the Squamish River frequently provides no dilution to the effluent. This undiluted discharge is a potential public health and fisheries hazard. The placement of this discharge as a submerged outfall in the Squamish River would provide more adequate dilution (see Section 4.2).

iii. The Air and Water Quality Work Group has indicated that ammonia levels in effluent samples are at levels which are potentially toxic to aquatic life. Besides improved dilution, as suggested in (ii) for the Mamquam plant, it is recommended that studies be conducted to assess the effect of the sewage effluent on ammonia values under worst case conditions in the estuary (see Section 5.2).

iv. The need for year-round chlorination and the possible requirement for dechlorination at those times when the sewage treatment plant effluents are being chlorinated should be re-assessed (see Section 5.2).

v. Samples collected by the District of Squamish for bacteriological analyses have not been collected in bottles containing sodium thiosulphate, negating the accuracy of these bacteriological data. Proper sampling techniques should be used for all collecting of chlorinated effluent samples for bacteriological analyses (see Section 4.2).

Estimated Cost and Duration: Costs for (i) will depend on the results of the engineering studies and assessment of flow metering. Costs for ii, iii, iv could be included in a 4-year assessment/action plan to cost $25,000 per year.

E.2.2 Mercury Contamination

Location: Cattermole Creek and barge channel (Figure 6, #2).

Rationale: FMC of Canada Ltd. had taken steps to upgrade discharges of mercury from its chlor-alkali plant. The abandoned settling pond is currently being upgraded by confining mercury contaminated sludge to a restricted area which has been covered with an impermeable membrane.

Significant amounts of mercury loss, which cannot be accounted for in the process, are the subject of discussions between government agencies and FMC. Although high mercury levels have been recorded in sediment samples, it is believed that these have resulted largely from discharges from FMC prior to 1972. Mercury levels in Squamish estuary sediments are elevated adjacent to the FMC chlor-alkali plant. High levels of mercury have been found in the sediments in Cattermole Creek.

Indications of mercury contamination of biota in Upper Howe Sound in 1970 precipitated a closure of commercial and sport fisheries by the Department of Fisheries. The ban on taking of salmon, trout, and herring was removed shortly thereafter while the closure was maintained until 1978 for other fish, shellfish, and crustaceans. Currently all recreational fisheries have been reopened while the commercial fishery remains closed for stock preservation and management purposes.

There are significant uncertainties concerning the mode of transfer of mercury to the food chain and inherent risks of resuspension of mercury from contaminated sediments over an enlarged area as a result of dredging activities.

Description:

Part I - Recommended Study

Specific recommendations pertaining to mercury-contaminated sediments have yet to be made. In view of the conflicting professional opinions regarding the dredging of sediments containing mercury, and the substantial development pressure on the most seriously affected area (Cattermole Creek), further study is recommended to resolve this issue. The objecive of the study would be to determine the relative merits and costs of removing or neutralizing the sediments. The assessment should include these options:

i. ocean dumping,
ii. dredging to a land fill, or
iii. filling the bulk of the affected area for industrial/port purposes with provision for alternate access to the upper portion of Cattermole Creek.

While the study should be primarily oriented to engineering aspects, any prospects for removing the sediments must include effective measures for eliminating or minimizing siltation and dispersal, given the present uncertainty regarding the environmental hazard of resuspension of mercury into the water column (see Section 5.2).

Estimated Cost and Duration: One year - $70,000.

Part II - Recommended Guidelines

a. All decisions related to dredging, dumping, or re-exposing mercury contaminated sediments (by dredging of overlying uncontaminated sediment deposited by the Squamish River) must be given careful site-specific consideration. In addition, approved dredging and dumping operations should be appropriately monitored (see Section 4.2).

b. F.M.C. of Canada should:

   i. complete during 1981, the work of filling the abandoned settling pond and covering it with an impervious layer (see Section 4.2).

   ii. continue to monitor groundwater wells adjacent to its abandoned settling pond three times per year, as outlined in its pollution control permit for monitoring groundwater wells adjacent to its solid waste disposal site (see Section 5.2).

   iii. continue efforts to reduce losses of mercury from all sources (see Section 4.2).

   iv. determine the remaining sources of mercury as yet unaccounted for (see Section 4.2).

E.2.3 Woodfibre Pulpmill

Location: Woodfibre - west coast of Howe Sound.

Description: The Air and Water Quality Work Group has assessed air emissions from this source as they affect the Squamish estuary study area. It is recommended that the Woodfibre operation should take the necessary steps to meet the conditions of its pollution control permit for air emissions in order to reduce the odour problem in Squamish (see Section 4.2).

E.2.4 Squamish Terminals Port Facility

Location: South end of East Delta (Figure 6, #3).

Description: The Air and Water Quality Work Group assessed the potential pollution sources at this facility and made the following recommendations:

Squamish Terminals should:

a. take steps to improve the recovery of waste oil.

b. take steps to reduce levels of pentachlorophenol and associated substances being transported into the estuary, by diverting yard drainage away from areas where wood preservation takes place, or where treated wood is stored (see Section 4.2).

E.2.5 Weldwood of Canada Ltd. Sawmill - Planemill Complex

Location: East bank of Mamquam Channel (Figure 6, #4).

Description: The Air and Water Quality Work Group assessed the potential pollution sources at this facility and made the following recommendations:

a. prevent pentachlorophenol and associated substances entering Mamquam Blind Channel, by diverting yard drainage away from areas where wood preservation takes place or where treated wood is stored, and by removing the dip tank from close proximity to the bank of Mamquam Blind Channel.

b. investigate methods to reduce the spillage of wood chips during the loading of barges (see Section 4.2).

Recommended Studies

E.2.6 Air Pollution Potential

Location: Estuary and surrounding areas.

Rationale: It has been recognized that local topography of the Howe Sound area makes air pollution potential in the southwest coast region a matter of concern. Air flow in the area is complex, and stability conditions can result in frequent inversions. The effect of air inversions and other local climatic occurrences on pollution emissions is not fully understood.

Description:

Part I - Temperature Inversion Monitoring

A study of temperature inversions, winds, and air quality in terms of Howe Sound which are designated for industrial use should be undertaken.

Part II - Haze Study

A study of the haze problem near Squamish should be undertaken to assess the degree and sources of air pollutants (see Section 5.2).

Estimated Cost and Duration: Part I - One year - $50,000.

Part II - One year - $30,000.

E.2.7 Hazardous Chemicals

Location: Squamish estuary

Description: Bulk quantities of chemicals are handled largely by the chemical and forest industry operations. In view of the quantities of chemicals shipped into and out of the area, complete review of their nature and quantity should be undertaken. A contingency plan protecting both the public and the environment should be maintained and updated on a regular basis (see Section 5.2).

E.2.8 Water Quality Monitoring

Water sampling of rivers by government agencies has not been carried out systematically. Existing data are based on samples which have typically been collected coincident with the freshet period at the sampling stations on the Squamish river (two sites), the Cheakamus, Stawamus, and Mamquam rivers. This has resulted in a paucity of data related to low flow conditions. The Air and Water Quality Work Group recommended that systematic sampling be carried out in future in order to develop a baseline of data (see Section 5.2).

Estimated Cost and Duration: Five years - $20,000 per year.

E.2.9 Organic Contaminants

Location: All discharges to estuary.

Description: Data on organic contaminants in the estuary is not available. The Air and Water Quality Work Group recommended that further testing for trace organic contaminants in discharges should be undertaken, with the emphasis of such a program being to determine the source and loading of these substances to the estuary, any bioaccumulation in the environment, and practical steps which might be taken to minimize the discharge of these chemicals (see Section 5.2).

E.2.10 Municipal Refuse Site

Location: West of Town of Squamish (Figure 6, #5).

Background: The District of Squamish muncipal refuse site was operated for a number of years in an area which was unacceptable to the Waste Management Branch due to high water table conditions. It was closed in June 1980. There is some concern regarding leaching from the site to the nearby Squamish River and possible methane gas generation from refuse decomposition.

Description:

Part I - Leachates

Based on concern regarding leachates from the closed site which could eventually enter the Squamish River system, the Air and Water Quality

Work Group recommends sampling of the leachates by the Waste Management Branch to determine their toxicity and zone of influence. Methods of limiting further leaching to the estuary should be investigated.

Part II - Methane Generation
The potential for methane generation at this site should be assessed by the proponent if future development is planned at the site or on adjacent lands (see Section 5.2).

Estimated Cost and Duration: Part I - Periodic inspections - $1,000 per year
Part II - to be determined if study is necessary

E.2.11 Chromium Level Monitoring

Location: East Delta

Description: The Waste Management Branch has measured elevated chromium levels in the ditch water adjacent to the CanadianOxy Chemical brine sludge landfill. These levels may be attributable to the landfill. The ditch water discharges to Cattermole Creek. The Air and Water Quality Work Group recommended that the Waste Management Branch monitor leachate from the landfill to pinpoint whether the landfill is the source. Any required corrective action could then be taken by the company, with additional monitoring for another two years to ensure no further problems (see Section 5.2).

Estimated Cost and Duration: Two years - $10,000 per year.

E.2.12 Groundwater Monitoring

Location: North end of Mamquam Channel (Figure 6, #7).

Description: Limited monitoring of a watercourse adjacent to the Weldwood Empire Lumber solid waste disposal site has shown evidence of minor contamination. Groundwater conditions should be monitored adjacent to this site to ensure that leachates from the landfill are not impacting on ground or surface waters (see Section 5.2).

Estimated Cost and Duration: $10,000 per year.

E.2.13 Squamish Terminals Rock Seepage Pit

Location: East Delta (Figure 6, #3).

Description: The Waste Management Branch, in periodic inspections of the intertidal zone adjacent to Squamish Terminals, have noted the influence of oil from the rock seepage pit. The Air and Water Quality Work Group has recommended that these inspections continue (see Section 4.2).

Estimated Cost and Duration: $3,000 per year.

E.2.14 Sedimentation

Location: Squamish River (Figure 6, #8).

Description: Studies of sedimentation processes indicated that the Squamish River delta is advancing at a steady rate (Zyniak and Durette, 1969). These studies recommended continued monitoring of the sedimentation processes, particularly in the vicinity of the migrating river bend and the delta. This recommendation was endorsed by the Air and Water Quality Work Group (see Section 6.2).

Estimated Cost and Duration: 5 years - $25,000 per year.

E.3 Land and Water Use

E.3.1 Log Handling and Storage Study

Location: Mamquam Channel and Central Basin of Estuary (Figure 6, #9).

Rationale: Log handling and processing is the dominant industrial activity in this area both in terms of economic importance and the quantity of land utilized. Attention should be given to assessing the requirements of present and future forestry-related activities and their relationship with other activities and resources in the estuary.

Description: Appropriate government agencies and forest product firms in the area should cooperate to prepare a log handling and processing strategy for Mamquam Channel and the Central Basin.

Part I

A benefit-cost study should be undertaken to identify, assess and recommend alternative means of handling and storing logs in the Squamish estuary. The study should define operational implications, including physical engineering and financial aspects of the various options. It should also include consideration of existing natural resources and adjacent activities. The following information should be assembled and included in the study.

Logging Industry Information Requirements

i. The present and future log handling and processing requirements of the Squamish estuary and the role which the Mamquam Channel will play in meeting those requirements.

ii. The current methods of log handling and storage in the estuary.

iii. The transportation characteristics of logs stored in the Squamish estuary including their eventual destination and period of storage in the estuary.

iv. The intensity of use of existing log storage and handling leases including an evaluation of the potential for more intensive or efficient use.

v. The identification and assessment of potential sites for dry-land log handling facilities.

Habitat Information Requirements

i. The importance of the estuarine habitats in this area in relation to their supply and role within the estuary as a whole.

ii. The degree to which log handling and processing is adversely affecting the productivity of existing habitats and an analysis of methods to improve the compatibility of logging-related activities with the natural environment.

iii. The potential for habitat enhancement and rehabilitation in Mamquam Channel including a benefit-cost analysis of possible projects.

Part II

The log handling and storage facilities in the Central Delta (C.R.B. Logging Company Limited) are generating a considerable amount of wood debris. Research has shown that excessive debris adversely affects the productivity and integrity of the habitat as well as water quality.

This operation has been identified as a non-conforming activity in the Management Plan due to its negative impact on the surrounding conservation area. However, due to the lack of readily available alternative sites, a careful evaluation of methods to reduce or eliminate the impact of this operation should be conducted in conjunction with Part I of this study.

The Coordinating Committee should facilitate cooperation among the facility operator and government agencies in the evaluation of relative costs and benefits, including environmental benefits, associated with the following options:

1. Relocation of the facilities to a more environmentally acceptable location and the setting of terms and conditions for development of a new site. If relocation is found feasible, the site should be considered for a possible public access/boat launch facility.
2. Upgrading of the facilities, including site modifications, clean-up procedures and improved operational methods to minimize environmental impacts. The Guidelines for Management (Section 3.0) should be used in this assessment (see Section 5.3).

Estimated Cost and Duration: Part I - One year - $50,000.
Part II - $40,000 over 6-12 months.

Note: As the majority of the present Crown foreshore leases for log handling will be due for renewal between 1982 and 1984, it is strongly recommended that those studies noted above be conducted and a log handling and processing strategy be developed and implemented by that time.

E.3.2 Port Options Study

Location: Mamquam Channel and East Delta (Figure 6, #10).

Rationale: Squamish offers some locational advantage, mainly to port and port-dependent industries. Provision of common access berthing facilities may attract off-estuary industries which require port access. Existing facilities are private and are limited to use by the owner-operator or for specific products (e.g., pulp, lumber) under contract. The Land Use Work Group has indicated that significant industrial/commercial growth would be related to the availability of common access port facilities. Thus, the potential for additional transhipment and berthing facilities in the Squamish area should be assessed.

Description: The port options study should address the following points:

i. The probable demand for port services over the next two decades.

ii. Whether a local common access port facility would adequately meet the needs of industries that may be attracted to the area.

iii. Where such development might best be located within the estuary or at nearby alternative sites.

iv. If it is determined that there is economic justification for consideration of port development in the estuary, the following options should be examined:

  a. Modifications to the existing Squamish Terminals port facilities.

  b. Expansion of Squamish Terminals through location of additional berthing facilities on either the east or west sides (or both sides) of the existing site.

c. New facilities on the southeast side of the Mamquam Channel, a site which the Land Use Work Group has indicated may have potential as a shallow draft port site.

d. For all port options, the following information should be assessed:
   - direct and indirect benefits to industry and to the community as a whole
   - potential impacts on adjacent activities, especially log handling and processing
   - potential impacts on biological productivity in the estuary, especially with relation to salmonid populations.

e. As the demand for a common access facility is likely to grow over time, the study should examine the possibility for a phased development of any feasible site (see Section 5.3).

E.3.3 Squamish Terminals Ltd. (Figure 6, #3)

At the commencement of the Squamish Estuary Plan, Squamish Terminals Ltd., the only port facility presently in the Squamish estuary, was nearing full capacity utilization for pulp shipments. The company indicated that additional facilities would be required to capture an increase in the export of pulp, lumber and general cargo from the B.C.R. service area. The firm has proposed a one or two-berth expansion and additional acreage to the north of the terminal to accommodate increased covered pulp storage while keeping existing lumber storage capacity. The Federal Department of

Fisheries and Oceans was prepared to consider the proposal for additional berths, but recommended against the proposed in-filling (required to create back-up land) on the north side.

During the preparation of the Management Plan, Squamish Terminals made the decision to proceed with construction of additional pulp warehousing space in the lumber storage area in order to meet its contractual obligations. The firm continues to be interested in expanding its berthing facilities and back-up land.

As part of the Management Plan preparation, the Habitat Work Group prepared a generalized habitat priority map for the estuary based on a detailed habitat classification map. The priority map indicates that the area requested by Squamish Terminals is "critical", i.e., an area "absolutely necessary for continuing present levels of production of estuarine species" (Habitat Work Group, 1981). The basis for this judgement is subject to some dispute.

No definitive designation of the area north of Squamish Terminals could be agreed upon by participants in the Planning Work Group. Alternatives for expansion of port facilities have not been fully assessed. Within the framework of the Management Plan, a proposal such as that of Squamish Terminals Ltd. could be submitted formally to the Coordinating Committee. The Committee would then decide upon a review process based on the provisions of the Planning Assessment Area (Section 3.0) and the Environmental Impact Assessment process (Section 2.0).

E.4 Habitat

The Habitat Work Group emphasizes that there are many opportunities for rehabilitation and enhancement projects in the Squamish estuary. The purpose of such projects is to restore alienated or degraded habitat areas or enhance the capability of low-productivity areas with the aim of increasing overall biological productivity. In order to plan for future uses of the estuary, general studies of fish and wildlife biology and estuarine ecology will also be necessary. The following recommendations are divided into proposed rehabilitation/enhancement projects and proposed studies.

It should be noted for many of the rehabilitation/enhancement recommendations, the first step will be an assessment of the cost and benefits as well as the technical feasibility of the recommended project.

Recommended Rehabilitation/Enhancement Projects

E.4.1 Dredge Spoils Site

Location: Central Delta (Figure 6, #11).

Rationale: Creation of the dredge spoil site adjacent to the training dyke destroyed approximately 14.2 hectares of productive *Carex* sp. marsh. This site is now included in a designated Conservation Area under the management plan (Section 3.0) but would need to be upgraded from its present status in order to be consistent with the designation.

Description: It is recommended that an environmental engineering study be undertaken to determine the feasibility of restoring the dredge spoil site in the Central Delta to a biologically productive state. The objective of the study would be to determine how the material could be moved, to where it could be moved, whether it could be moved without prohibitively adverse environmental effects, and the associated cost of any enhancement projects. This assessment should be undertaken by the department of Fisheries and Oceans and the Fish and Wildlife Branch of the Ministry of Environment, who would then implement any projects found to be technically and economically feasible.

If removal of the dredge spoil is shown to be infeasible, the study could be augmented to examine the costs and environmental benefits of modifying the dredge spoil site to provide a diversity of habitat types ranging from tidal channel/marsh habitat to treed, terrestrial habitat. Possibilities for limited recreational use of the restored site e.g., provision of a cartop boat launch, also should be examined. In either case, restoration of the site should be implemented (see Section 5.4).

Estimated Cost and Duration: 6 months to 1 year - $10,000.

E.4.2 Training Dyke - Central Delta

Location: Central Estuary.

Rationale: Construction of the training dyke, the railway line, and the road to the shipping terminal have directly alienated habitat by removing it from the aquatic realm. This construction has also resulted in a nearly complete elimination of riverine water flow to the east arm of the river and the central basin of the estuary. The resultant alteration of flushing and circulation patterns has resulted in a decrease in sedimentation rates and a general increase in salinity in the Central Basin. This reduced fresh water flow initially resulted in improved habitat stability in the Central Basin and increased biological productivity. Long-term effects of increased salinity are yet to be determined.

Description:

Part I - Enhancement Project

The Air and Water Quality, Habitat and Land Use Work Groups have all recommended that studies be conducted to determine the benefits which could be derived from installation of water control structures and/or additional culverts through the training dyke to provide greater flow of fresh water into Central Delta. Possible benefits of increasing fresh water flow to the basin would be in maintenance of the "natural" condition of the area, improved flushing, reduced salinities, and an overall improvement in fish and wildlife utilization and capability.

If the studies indicate net benefits, they should be followed by joint engineering, biophysical and economic studies to determine the most effective means of increasing flows through the training dyke. While the studies would likely be undertaken by government agencies with fish and wildlife jurisdiction, some funding for enhancement may be available through government habitat enhancement programs and conservation groups such as Ducks Unlimited (see Section 5.4).

Part II - Training Dyke Effects

Rationale: In light of the importance of sedge rhizomes as cover for invertebrates, Levings (1976) has suggested that the long term effects of the training dyke on marshes of the central area of the estuary should be monitored. It is possible that the increase in salinity may have a detrimental effect on the brackish water species, *Carex lyngbyei*.

Description: A study plan would involve an annual summer survey of marsh vegetation which would indicate changes in the *Carex lyngbyei* distribution (see Section 5.4).

Estimated Cost and Duration: Part I - Two-year assessment - $30,000. Costs for construction projects would be determined in detailed studies.

Part II - 4 man-months per year for 3-5 years - $8,000 per year.

E.4.3 Isolated Tidal Channels

Location: Central and East Deltas (Figure 6, #13).

Rationale: Tidal channels have been partially or totally isolated from the remainder of the estuary by man-induced or natural causes. The full potential of these channels for use by salmonids, other fish, and waterfowl is not being reached. In addition, nutrients and detritus which would normlly be transported to the outer portions of the estuary via these channels are trapped.

Description: It is recommended that these channels be reconnected to Howe Sound. The work involved would be similar to level-ditching undertaken in many marsh improvement projects. The project would improve available habitat by restoring accessibility and by increasing the ratio of open water to emergent vegetation. Diversity of habitat would be increased, as would species use.

The relatively low cost and high benefits of this project may make it attractive to Ducks Unlimited, who should be formally approached (see Section 4.4).

Estimated Cost and Duration: 6 months - $150,000

E.4.4 Sedge Marsh

Location: Sedge marsh east of B.C. Railway mainline at the southeast side of Mamquam Channel (Figure 6, #14).

Rationale: The productivity of this sedge marsh has likely been decreased since it was isolated from Howe Sound by the railbed of the B.C. Railway line. Improved water circulation between the marsh and Mamquam Channel would permit increased nutrient exchange, and would also allow fish to utilize the marsh.

Description: The costs and benefits of reconnecting the marsh to Howe Sound by installing water control structures under the railbed should be assessed by government agencies in a series of on-site investigations and meetings. If benefits to waterfowl are identified, Ducks Unlimited could be approached for funding (see Section 5.4).

Estimated Cost and Duration: Feasibility study - 6 months to 1 year using existing staff and resources. Construction of control structures - $10,000.

E.4.5 Meadow Habitat

Location: East Delta, west of town centre of Squamish.

Rationale: This meadow was isolated from the upper inter-tidal area by the construction of a flood control dyke. It could be restored to a more biologically productive state by either reconnecting the area to the Central Basin, or by improving the dyke and managing the area as a brackish impoundment.

Description: The costs and benefits of enhancing biological productivity in the area should be assessed by government agencies, perhaps with the cooperation of Ducks Unlimited. The latter group is interested in undertakng habitat rehabilitation work in impacted estuarine areas. If adequate benefits are proven, Ducks Unlimited may be prepared to assume all costs of development (see Section 5.4).

Estimated Cost and Duration: Feasibility study: existing staff and resources

Restoration Project: 1-2 years - $300,000.

E.4.6 Eelgrass Planting

Location: Estuary

Rationale: Eelgrass beds are extremely valuable to biological productivity. They provide a spawning substrate for herring, a food source for some species of waterfowl, cover for crabs and invertebrates, and a minor source of detritus for the estuary. Eelgrass was formerly found in the Squamish estuary.

Description: An assessment should be made of the feasibility of reestablishing eelgrass in the estuary. The first step should be an oceanographic study to determine which of the historic eelgrass areas are still physiologically acceptable for eelgrass. A source for donor stock of eelgrass would have be to identified and test plots at various densities and depths would be planted at suitable locations within the estuary. The test plots would be regularly monitored to establish optimum transplant requirements (see Section 5.4).

Estimated Cost and Duration: 1 year - $30,000.

E.4.7 Wood Wastes

Location: East delta, north of shipping terminal (Figure 6, #16).

Rationale: Logs and other wood debris have accumulated on the west side of the railway in the east delta. The accumulation of this debris may be adversely affecting the potential biological productivity of the area.

Description: An assessment should be undertaken of the benefits and costs of removing the accumulation of logs and other wood debris from this area. Ducks Unlimited has indicated that they would be prepared to undertake an analysis of this proposal in cooperation with technical experts within government agencies.

Estimated Cost and Duration: Assessment - 6 months to 1 year - existing staff and resources.

Project: Costs might be assumed by Ducks Unlimited if the project was determined to be feasible and beneficial (see Section 5.4).

E.4.8 Nesting Structures

Location: Estuary.

Rationale: The Habitat Work Group Report suggests that nesting structures could be erected in several parts of the estuary for Canada geese, wood ducks, and possibly mallards. Beyond the obvious benefits to nesting birds, the major value of such a program would be in public involvement and support for the wildlife resources of the estuary.

Description: An assessment program could be designed by the Canadian Wildlife Service and the Fish and Wildlife Branch of the Ministry of Environment for Rod and Gun Clubs, naturalist groups and schools who show interest in the proposal. However, nesting enhancement in the estuary should not be undertaken until a thorough study is done to ensure such a change won't adversely affect this primary use of estuarine habitat. Alternative ways to enhance public awareness and involvement should be examined (see Section 5.4).

Estimated Cost and Duration: Feasibility study: existing staff and resources.

Nesting structures installment: 1-2 years - structures cost about $20 each but could be donated by Ducks Unlimited, wholesalers, or obtained inexpensively through Corrections Branch programs.

Recommended Studies

Most of the studies suggested below are intended to gather information that will be useful in assessing general and site-specific biological productivity within the estuary. This information is needed to assess fully the condition of various parts of the estuary for decision-making regarding enhancement, rehabilitation and future development activities.

Agencies who undertake the studies should attempt to combine, where possible, various study suggestions in order to make most efficient use of staff and resources. For example, Primary Productivity studies could be combined with Salinity Profiles, Training Dyke and Eelgrass Studies.

E.4.9 Habitat Classification Map

Location: Estuary.

Rationale: The Habitat Classification Map produced by the Habitat Work Group is based on aerial photo interpretation, existing studies and some ground checking (i.e., field surveys). As this information will be important for decision-making, especially in the areas designated "Planning Assessment" (Section 3.0), it is essential that this information be accurate and up-to-date.

Description:

Part I - Habitat Map Checking

Through photo interpretation, general survey techniques, and extensive field cross-checking, the habitat zone boundaries and the accuracy of classifications of the Habitat Classification Map should be verified and refined. Current mapping standards could be improved by use of the revised material and existing government draughting services.

Part II - Habitat Base Monitoring

A monitoring program should be implementated to record changes to the habitat base as a result of both natural and man-induced causes. A task force of representatives from federal and provincial resource agencies should be formed to implement an annual field survey of the Squamish estuary. This survey would occur over several days each year and would concentrate on changes in habitat type or areas of human activity. Information could be used in updating the Habitat Classification Map (Part I) (see Section 5.4).

Estimated Cost and Duration: Part I - 10 months - $25,000.
Part II - On-going utilizing existing staff and funding.

E.4.10 Primary Productivity

Location: Estuary.

Rationale: Benthic algae and marsh vegetation of the Mamquam delta have not been studied as fully as those of the other Squamish River delta areas. Howard Paish and Associates Limited (1972) reported that the highest productivity of benthic algae on the delta was measured in Mamquam Channel but no methods or literature sources were mentioned. Marsh vegetation on the Central and Mamquam deltas was incompletely mapped by Lim and Levings (1973) according to Kennedy (1978) and Levings and Moody (1976). Studies of the vegetation community function in the delta (Pomeroy, in prep.) do not consider the fate of removed organic material in detail.

Description: A study plan to assess further primary productivity in the estuary would include the collection of data pertaining to productivity of major algal species over a period of at least one year. The study would focus on comparative primary productivity of areas within the estuary.

Estimated Cost and Duration: 2 staff for 1 1/2 to 2 years - $50,000 per year.

E.4.11 Benthic Invertebrate Populations

Location: Estuary.

Rationale: Some habitats within the study area have not been studied in any detail with respect to benthic invertebrates. For instance, no information is available on freshwater invertebrates inhabiting the river channel between the culverts and the upper boundary of the study area and only preliminary observations have been made on subtidal invertebrates of the delta front (McDaniel, 1973). It is therefore not known if these habitats contribute to the food chains which are important to the fisheries resource.

Description:

Part I - Invertebrate Sampling

A study should be undertaken to fill data gaps regarding invertebrates. Sampling of invertebrates should be undertaken every three weeks in spring and summer when life cycles are generally shortest, to gain information on numbers, generation time, and seasonal variation. Laboratory studies of feeding, growth, and fecundity would supplement field information.

Part II - Amphipod Study

Levings (1980b) did not obtain information on generation time and longevity of Eogammarus confervicolus during his studies on this species of benthic amphipod. This information would be of particular value in examining how the species is exploited by juvenile salmonids. Sampling should be undertaken every three weeks for one year to gain information as in Part I for this particular species (see Section 5.4)

Estimated Cost and Duration: Part I - 2 work months every year for 10 years - $50,000 total.

Part II - Costs and time requirements would depend on how this study could be combined with Fisheries Resources studies (see E.4.12 below) as well as Part I of this section.

E.4.12 Fisheries Resources

Location: Estuary.

Rationale: Many aspects of fish biology and habitat relationships in the Squamish estuary are poorly understood. Further information would aid in interpretation of the Habitat Classification maps and other data for decision-making purposes.

Description: Areas which should be further investigated are:

1. The inventory and biology of all fish species using the estuary.
2. The use of the estuary by steelhead trout, cutthroat trout, and Dolly Varden char, as well as use by Pacific salmon.
3. The relationships between habitat units and the fish species which use them.
4. The identification of possible impacts of environmental change in the estuary on salmonid populations and other fish species.

A study plan would consist of year-round fish sampling to be conducted over one to three years. Information on species, distribution, stomach contents, growth, and residence time (mark/recapture) would be collected. Stomach contents could be correlated to habitats through collection of benthos, plankton, vegetation and water samples, as well as through measurement of salinity and temperature (see Section 5.4).

Estimated Cost and Duration: 3 staff per year for 3-6 years - $75,000 per year.

E.4.13 Wildlife Resources

Location: Estuary.

Rationale: Many aspects of wildlife biology and habitat relationships at the Squamish estuary are also poorly understood. Although sufficient data exist to document the dependency of wildlife species on the estuary as a whole, in many cases data are insufficient to identify specific habitat types of special importance to individual species.

Description: Some areas which require further study are:

1. The inventory and biology of all wildlife species using the estuary.
2. The relationshps between habitat units and the wildlife species which use them.
3. The rates of turnover among migratory species using the estuary.

4. The interrelationships between the wildlife species using the estuary.

Year-round data collection to establish wildlife use and habitat utilization patterns would be required. Data on species, distribution, habitat use, food preferences, and residency time (turnover) would be collected. Computer analysis of data could be beneficial depending on study design (see Section 5.4).

Estimated Cost and Duration: 3 staff per year for 3-6 years - $75,000 per year.

E.4.14 Salinity Profile monitoring

Location: Estuary.

Rationale: Gaps exist in the salinity data collected by Levings *et al*. (1976). For instance, December 1974 was the only sampling time when all areas of the delta were sampled. The same detail of sampling would be of more value if conducted during March (low flow) and June (high flow).

Description: A synoptic oceanographic study of the Squamish estuary should be undertaken. Data collection and analysis of at least four surveys over one year would be required to cover adequately all periods of high and low flow (see Section 5.4).

Estimated Cost and Duration: 3 staff per year over 1 1/2 years - $75,000 per year.

E.5 Recreation

E.5.1 Regional Tourism Plan

The B.C. Ministry of Tourism, Ministry of Industry and Small Business Development (M.I.S.B.D.), the Federal Government Office of Tourism and Department of Regional Economic Expansion have commissioned a Regional Tourism Plan for southwest B.C. which includes the Squamish area. This plan, which is scheduled for release in 1981, addresses the possible role of Squamish as a regional services centre on the highway corridor to Whistler/Pemberton and makes suggestions regarding the role of the Royal Hudson and other tourist possibilities in the town of Squamish including provision for estuary and industrial interpretation. Decisions made on the basis of the Tourism Plan and the District of Squamish Official Community Plan will influence the direction for tourism development in the area. Priorization of the following recommendations should be determined within the context of these plans when they are finalized.

Recreation Enhancement Recommendations

E.5.2 Riverside Camping

Location: East Delta.

Rationale: Camping opportunities are few in the Squamish area, with one private campground at Shannon Falls. Information camping areas along the Squamish River are dispersed and unserviced. Provision of camping facilities could enhance public use of the estuary and tourism for the town.

Description: A campground near the Squamish/Mamquam confluence, to be operated by the District of Squamish or its agent, should be considered to improve public access to enhance recreational use of the estuary. The suggested site is a relatively self-contained parcel of crown land, bounded by railway tracks, a road and the training dyke (see Section 4.5).

Estimated Cost and Duration: $300,000 over 3 years.

E.5.3 Public Access to Estuary

Location: Estuary, especially East Delta (Figure 6, #18).

Background: The Recreation Work Group concluded that improved pedestrian and small boat access and information for the public would increase the volume and diversity of uses, attracting picnickers, sightseers, nature enthusiasts, small boaters and a variety of organized groups from both the District and the Region. Existing access points are not clearly designated, serviced or marked.

Description: At least three sites for proper public access should be considered: one for foot traffic along the Squamish River and down the training dyke; another would allow vehicular access and a cartop boat launch at the CRB logging dump; a third would permit foot access from the Royal Hudson trail along an interpretive walk off Vancouver Street. Parking, toilets, garbage receptacles and informational signing would be provided (see Section 4.5).

Estimated Cost and Duration: $200,000 over 3 years.

E.5.4 Industrial Interpretation

Location: Mamquam channel (Figure 6, #19).

Background: There is concern that there is no tourism focus for the Royal Hudson train passengers who spend several hours in Squamish. Opportunities exist for industrial interpretation, logging history and estuary interpretation themes (see 4.5) which would enhance public knowledge of both industrial activities and natural history in the area.

Description: Considerable potential exists for industry to undertake a program of landscaping, tours, public access and interpretive opportunities. This is particularly apparent in the Mamquam Channel where civic initiatives could develop an attractive waterfront/commercial development that would capitalize on the proximity of industrial activities and the waterfront itself as a public attraction (see Section 4.5).

Estimated Cost and Duration: $200,000 over 4 years.

E.5.5 Estuary Interpretation

Location: Estuary, expecially East Delta (Figure 6, #20).

Background: There is some concern that the possibilities for nature interpretation and appreciation are not being used to full advantage. The Squamish estuary is accessible to a large population and is adjacent to a major transportation corridor.

Description: The Squamish Estuary Nature Centre *ad hoc* Committee has proposed an interpretive centre and trail system for the East Delta. This proposal and other alternatives for estuary education and interpretation activities should be assessed (see Section 4.5).

Estimated Cost and Duration: unknown.

E.5.6 Marina Facilities

Location: Estuary - Mamquam Channel (Figure 6, #21).

Rationale: The Squamish Yacht Club, which maintains and operates the only facility for pleasure boaters in upper Howe Sound and also provides a large proportion of the moorage for recreational boats in Squamish, is currently experiencing peak demands for berths, parking and launching facilities.

Description: A study should be undertaken to examine the current and expected demand for moorage and the options for provision of moorage. Options include expanding the capacity of the present marine site, locating and developing an additional civic marine facility within the Squamish vicinity, locating and developing a site for relocation of an expanded Yacht Club, or other possible alternatives. The Squamish Yacht Club should participate in formulating the study terms of reference and funding of the study (commensurate with benefits to be derived) (see Section 5.5).

Estimated Cost and Duration: $250,000 over five years.

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Appendix F

APPENDIX F: DETAILS OF AREA DESIGNATIONS

F.1 Conservation Area 1

Designation Rationale

In order to ensure that the natural processes and productive capacity of the estuary can continue to function, those areas which exist in a relatively undeveloped state and have retained their biological productivity must be maintained and where appropriate, enhanced. The west delta and central delta portions (see Figure 3) of the estuary meet this criterion as little man-induced modification has occurred except for the river training dyke and the dredge spoil site. Consequently, this area should serve as a focus for conservation and enhancement activities.

The conservation of this area is further supported by the findings of the Habitat Work Group. The Work Group's habitat priority map indicates that the majority of Conservation Area 1 is composed of habitat which is either critical or important for estuarine species. The Work Group recommends that the biological productivity of these areas should be preserved or enhanced to permit the continuation of their role as integral components of the estuarine environment.

Conservation Area 1 has also been identified by the Recreation Work Group as one of the most attractive recreational sites in the estuary.

Current activities include walking, observation, boating, hunting and angling. Demand for these compatible recreational pursuits further serves to justify the maintenance of this area as relatively unspoiled estuarine habitat.

Specific Management Recommendations

The following studies or actions are recommended to aid in the achievement of the management objectives for this designation. Details on the type of study or action and the estimated cost and duration are contained in Appendix E and may be referred to by turning to the section noted in the parenthesis.

Sewage Treatment Plants (E.2.1)
Log Handling and Storage Study - Part 2 (E.3.1)
Dredge Spoils Site (E.4.1)
River Training Dyke - Part 1 (E.4.2)
Isolated Tidal Channels (E.4.3)
Riverside Camping (E.5.2)
Public Access to Estuary (E.5.3)
Estuary Interpretation (E.5.3)

F.2 Conservation Area 2

Designation Rationale

This area is bounded on the north by the north shore of the Stawamus River, on the south by placed fill and on the east by the railroad grade, and excludes all existing log storage leases to the west. The Habitat Work Group has identified this area as possessing prime intertidal habitats which are relatively scarce within the estuary and form an integral component of the Squamish estuary system. This area also will provide a buffer between the banks of the Stawamus River and the adjacent industrial/commercial area in order to maintain the environmental quality of the mouth of the river.

F.3 Industrial/Commercial Area 1

Designation Rationale

This area is the present location of the majority of industrial/commercial facilities within the Squamish estuary. Mamquam Channel has historically provided access to a variety of activities and continues to serve as a focal point for economic development. As a result, it is imperative that the present land owners and lease holders in this area be given better security of tenure and that intensified development in this area be encouraged. The industrial/commercial designation is intended to provide a framework for achieving these requirements.

Specific Management Recommendations

The following studies or actions are recommended to aid in the achievement of the management objectives for this designation. Details on the type of study or action and the estimated cost and duration are contained in Appendix E and may be referred to by turning to the section noted in the parenthesis.

Log Handling and Storage Study - Part 1 (E.3.1)
Port Options Study (E.3.2)
Squamish Terminals (E.3.3)
Industrial Interpretation (E.5.4)

The Air and Water Quality Work Group has identified evidence of mercury contamination in the sediments of Cattermole Creek, Mamquam Channel and the area adjacent to the Squamish Terminals berthing area. The Work Group notes that in view of the significant uncertainties concerning the mode of transfer of mercury to the food chain, and the inherent risks of resuspension of mercury from contaminated sediments over an enlarged area as a result of dredging activities, decisions related to dredging, dumping, or re-exposing mercury contaminated sediments (by dredging the overlying uncontaminated sediment deposited by the Squamish River) must be given careful site-specific consideration.

The following studies or actions are recommended to aid in the achievement of the management objectives for this designation. Details on the type of study or action and the estimated cost and duration are contained in Appendix E and may be referred to by turning to the section noted in the parenthesis.

Mercury Contamination (E.2.2)

F.4 Industrial/Commercial Area 2

Designation Rationale

A major portion of this area historically was used as a sanitary landfill. The area has good access both by road on the east and by railway on the west. There are no significant environmentally sensitive resource values in this area north of the upstream extremity of the tidal Cattermole Creek channel.

Specific Management Recommendations

The portion of this area which is the former location of a sanitary landfill will require appropriate construction safeguards for any developments.

Certain studies or actions were recommended by the Air and Water Quality Work Group which would, if implemented, aid in achievement of the management objectives for this area. These are outlined in Appendix E, section E.2.10.

F.5 Planning Assessment Area 1

Designation Rationale

The portion of the Squamish estuary within this designation possesses identified value for both conservation and industrial/commercial oriented uses. However, these values have not been defined and compared sufficiently to place confidently the area, or parts of the area into either of the two definitive designations. Part of this inability is related to deficient knowledge of the comparative biophysical and economic value of the area in general, while another part is attributable to a lack of information on specific sites. Accordingly, additional information on this portion of the estuary must be obtained before further refinement of the designation may be made.

Specific Management Recommendations

The following studies or actions are recommended to aid in the achievement of the management objectives for this designation. Details on the type of study or action and the estimated cost and duration are contained in

Appendix E and may be referred to by turning to the section noted in the parenthesis.

Habitat Classification Map (E.4.9)
Fisheries Resources (E.4.12)
Public Access to Estuary (E.5.3)
Estuary Interpretation (E.5.5)
Marina Facilities (E.4.6)

F.6 Planning Assessment Area 2

Designation Rationale

The portion of the Squamish estuary within this designation possesses identified value for both conservation and industrial/commercial oriented uses. However, these values have not been defined and compared sufficiently to place confidently the area or parts of the area into either of the two definitive designations. Part of this inability is related to deficient knowledge of the comparative biophysical and economic value of the area in general, while another part is attributable to a lack of information on specific sites. Accordingly, additional information on this portion of the estuary must be obtained before further refinement of the designation may be made.

Appendix G

APPENDIX G: SUMMARY OF REVIEWS OF THE DRAFT SQUAMISH ESTUARY MANAGEMENT PLAN

G.1 Introduction

After release of the Draft Squamish Estuary Management Plan in early March, 1982, all interested parties were encouraged to submit written comments or briefs to the Public Involvement Work Group, or alternatively, to the Planning Committee during the following two month period of review. In addition, the Public Involvement Work Group released a review questionnaire aimed at gathering a sample of public opinion on the Draft Squamish Estuary Management Plan.

At the end of the review period, a summary analysis was made of all briefs which had been submitted to the Public Involvement Work Group and the Planning Committee. In particular, selected issues were identified and classified according to the specific subjects they represented in the Draft Squamish Estuary Management Plan. This summary is presented in Section G.2 and represents diversified opinion from individuals, special interest groups, industry, corporations and government agencies. These selected issues were used by the Planning Committee in making appropriate amendments to the Draft Squamish Estuary Management Plan during their final review process.

In many cases, general comments and recommendations were submitted which did not pertain to specific areas of text in the Draft Squamish Estuary Management Plan. Many of the opinions did, however, offer views which would help to guide management of the Squamish Estuary in future years. Consequently, these general comments and recommendations, whether factual or not, have been presented in Section G.3.

During the review period, questionnaires prepared by the Public Involvement Work Group assisted in gathering specific comments on selected topics presented in the Draft Squamish Estuary Management Plan. Such topics dealt with the proposed management system, estuary uses and public involvement. The analysis of response to the Public Involvement Work Group Questionnaire is presented in Section G.4.

G.2 Summary Analysis of Briefs Submitted to the Public Involvement Work Group and Planning Committee

Subject: Coordinating Committee

Recommendations:

Equal representation of environmental and industrial interests is necessary to equalize biases.

Chairman should be neutral to any agency or group.

Industrial Assessment Committee should be appointed to parallel the Environmental Assessment Committee.

Ministry of Forests should be involved.

Chairman of Coordinating Committee should not be the Implementation Coordinator.

Shouldn't private industry be represented on the Coordinating Committee? (Including forest industry).

Will there be a continuing need for the Coordinating Committee or should it's role be evaluated in future years? i.e., should a "sunset" clause be put in the DMP?

The Coordinating Committee would be ineffective if it was only composed of the same member organizations as the Planning Committee.

The Coordinating Committee should receive a prospectus on each proposal before selecting an appropriate form of assessment. The Coordinating Committee cannot 'recognize when a project should be administered by another process...' (see section 2.4.1) until it understands the nature, extent, location and probable impact of the project. It was intended that this information be obtained through use of the prospectus. Accordingly, it is recommended that the prospectus be required in all cases and be used as the basis for determining the appropriate form of review.

Industry and the National Harbours Board should be represented on the Planning Committee, (future Coordinating Committee).

Public interest groups should be represented on the committee.

Section 2.4.3 - First sentence, last paragraph: "The Coordinating Committee may..." ...The may should be changed to will.

"The Coordinating Committee will seek to function by consensus."

It is inevitable in the field of resource allocation involving more than one regulatory agency that an issue will arise for which a concensus cannot be reached. When this situation occurs within the Coordinating Committee for the Squamish Estuary, how will the Committee proceed? Obviously some resolve must be reached in order to be fair to the proponent.

"...it is expected that these agencies will administer their existing policies and procedures in conformance with the intent of the Management Plan."

Is there any assurance that mandated agencies will in fact administer their policies in accordance with the Management Plan given above? What if the opposing agency on the Coordinating Committee was the regulatory agency governing on a particular issue? Does the whole system of committee consensus management breakdown? Who will decide on an issue when a consensus cannot be reached and will this decision be binding on all the agencies involved? Delegation or designation of this decision-making power will be a contentious issue and not accepted lightly, if at all, by any agency with mandated jurisdiciton for the Squamish Estuary.

Subject: **Implementation Coordinator**

Recommendation:

Implementation Coordinator should implement decision-making, but should not be responsible for making decisions. Therefore, the implementation Coordinator should not be on the Coordinating Committee or serve as its chairman.

Subject: **Area Designations**

Recommendations:

Appendix 'F' should be inserted as section 3.2.5. The rationale for the designation of each area and the management recommendations should be combined to focus on area use and refinement of area designations.

If this step is not taken, consideration should be given to moving 4.2 #3 to section 5 and 5.3 #2, 5.4 #1, 2, 4, 5 and 7 to section 4.

Subject: **Industrial/Commercial Area**

Recommendations:

The existing Industrial/Commercial area is already heavily regulated by permits and restrictions. An additional "permit or approval requirement as envisaged by the introduction of the Coordinating Committee" is not seen as a necessity, nor is it deemed fair. Unless the Coordinating Committee can have absolute responsibility (without needing referral to other government bodies), in the I/C area, then otherwise, its power should be restricted to the Planning Assessment and Conservation areas.

"This area in the section immediately north of Squamish Terminals should be shifted to the north into PA 1 to take in the side area the terminals wish to fill for future expansion. If another shift is required to give the terminals its second ship berth, that should be done as well. I suggest that this be done now rather than at a later date when the area and usage would have to be brought out of Planning Assessment. I have to bear in mind that any area in PA status that is undeveloped now will be very hard to take out as all those factions opposed to development will take PA status as synonymous with Conservation."

Page 55, Figure 5: There are several important habitat areas that are situated within I/C area. Examples are the intertidal area just south of the log dump adjacent to the mouth of the Stawamus River and the intertidal area between the railway, and Highway 99 in this same general area. I am concerned that these areas and others in the I/C designation may not receive the protection or attention they deserve. I recommend that these areas be removed from the I/C designation or that the policy guidelines for this designation be expanded to include a provision for protecting valuable estuary habitats that lie within I/C areas.

Subject: Planning Assessment Area: East Delta

Recommendations:

"A large part of the East Delta should receive industrial designation as much of the land is above high tide levels."

"No industrial development".

Include the East Delta in the area designated Conservation.

"The eastern section of this area, that is the section along Cattermole Creek between the rail lead to Squamish Terminals and the town of Squamish, should be excluded from this Planning Assessment Area at this point in time. This area is physically linked to the commercial, residential and industrial base of Squamish. To leave it in limbo for future designation will only cause conflict within the community. All of what we are doing in area designations is compromise. I suggest we take the step now and commit this area to incorporation into designation I/C 1."

Subject: Conservation Area 2

Recommendations:

Does C2 include all or part of water lease #1717, (which is used for log storage)?

Map on p. 55 suggests this; p. 203 does not.

"Conservation areas should be designated in a totally inflexible way. Any flexibility in their status constitutes an immediate and unacceptable threat to their productivity and existence."

"Public Works Canada carries out maintenance dredging of the Mamquam Blind Channel at roughly five year intervals. The usual dredge area is the channel from the mouth of the Stawamus River downstream to deep water and a settling basin at the mouth of the Stawamus. The boundary of conservancy area C2, shown on page 55, is close to the edge of the settling basin. Since the settling basin has been located to preserve the vegetation on the adjacent marsh, we are concerned that the conservancy not include the settling basin."

Subject: Planning Assessment Area 2: North Mamquam

Recommendations:

PA 2 should be designated conservation due to wildlife values...There is definite potential for extensive recreational use. (?)

"Again I would say to leave this area in limbo as a Planning Assessment area is just going to create unnecessary conflict within the community in the future. For years now this area has been much discussed as a conservation area and future recreation nucleus for Squamish. I believe that your committee has somehow failed to gain a proper interpretation of community interest in this regard. To designate this now as a conservation area would be very popular in the community and would create the opportunity for development of strong recreational orientation of this area."

Subject: Amending the Plan

Recommendation:

"What magnitude of amendment will be considered minor. Surely it would be possible to give some reasonably specific guidelines as to what would be considered a minor change."

Subject: Policy Guidelines

Recommendations:

During the preparation of the guidelines portion of the Management Plan, it was recognized that there were two audiences to be addressed. The government decision-makers required policy guidance to aid them in conforming to the intent of the Management Plan. At the same time, industrial, commercial, recreation and conservation interests required guidance as to how they could design and operate their activities to most effectively support the Management Plan. These two audiences and their respective needs formed the basis for having separate Management Policy Guidelines and Environmental Guidelines Development. This intent is still reflected in section 3.1, however, the combination of the guidelines in sections 3.1.1 to 3.1.8 negates the effect. From a reader's perspective, Policy Guidelines may prove intimidating (i.e., government oriented) and thus eliminating the opportunity to develop a commitment amongst the private sector to the implementation of the Management Plan.

At a minimum, I would recommend a name change to Management Guidelines. However, to maintain the initial thrust of the guidelines and maximize their effectiveness, serious consideration should be given to separating the two types of guidelines.

Subject: Log handling and storage

Recommendations:

Current water access must be maintained.

Mamquam Channel "Log Handling and Storage Study" would be costly and should not be considered until after the coast wide study is completed (see p. 171).

Instead, lease sites should be provided with long term tenure to facilitate and encourage improvements in existing methods, (see p. 38, which recommends this).

The federal/provincial/industry/labor task force is developing a "Code of Good Practice" for the transport, handling and use of anti-stain chemicals in B.C. sawmills. The code will establish guidelines in mid-1982, which will regulate procedures as suggested on p. 165 E.2.5.a.

Subject: Salmon Stocks

Recommendation:

The Management Plan should give greater consideration for the provision or development of fish hatcheries.

Should paragraph 3.1.3.10 specify non-steam emissions?

Subject: Tourism

Recommendations:

Contrary to p. 155, Squamish will likely become a major focus for tourism.

"Some mention should be made of a need for a launch/mooring site for larger recreational boats and the desirability of two or three launch sites for cartop boats and canoes.

A small launch site for example, with minimal parking somewhere on the training dyke would allow some reasonable access to the west bank of the river without completely opening it up to unacceptably heavy impacts."

Subject: Information Banks

Recommendations:

The Vancouver Public Library or the UBC Library should be considered as sites for a duplicate Information Bank.

Suggested amendments to the Plan should be made available in the Information Banks.

Subject: Public Involvement

Recommendation:

"Public involvement should be built into the Plan and the basic structure of that involvement should be spelled out."

Subject: Suggested additions or changes to text

Recommendations:

The Preface would provide a more complete introduction to the Management Plan if reference was made to the study area and Figures 1 and 2 were included. It is recommended that reference to, and illustration of, the study area be moved from pages 2, 3 and 4 to the Preface.

The permissive tone of the policy guidelines (Section 3.1) is of some concern to us. The chronic use of the word "should" throughout the guidelines implies that the developer can choose whether or not to employ environmentally acceptable standards. For example, the final sentence in paragraph 2 of page 35 states, "Each landowner and/or developer should adhere to sound environmental construction, design and operational principles." I suggest that "should" is too lenient a word to use in such a statement if the stated objective that habitat values are to be "optimized" (page xvi) is to be achieved. From our point of view, if that objective is to be achieved, sound environmental design and methodology must be adhered to. Otherwise the whole exercise little more than lip-services the stated objective.

It is recognized that some of the guidelines contain the words "must" or "shall" instead of "should". It is further recognized that in some situations there must be latitude for choice. However, if habitat values are to be optimized, it is recommended that many of the remaining "shoulds" be changed to "must"--at least in the following guidelines:

3.1.2.1; 3.1.3.3; 3.1.3.4--twice ("facilities must be designed" and "applicant must show"); 3.1.3.5; 3.1.3.7; 3.1.4.4; 3.1.4.5; 3.1.5.1; 3.1.5.3; 3.1.6.4; 3.1.6.5; 3.1.6.6--change "should not be considered" to "must not be conducted"; 3.1.6.8 (i)-"Consideration must be given" and "No intertidal/marine site shall be used"; 3.1.6.8 (ii)--"Consideration must be given"; 3.1.6.9 (i)--"proper diversion---must be provided"; 3.1.6.9 (ii) twice; 3.1.6.9 (iii).

Page 2, line 3: Is not the Elaho River and its tributary creeks also one of the major tributaries of the Squamish--at least on a par with the Mamquam?

Page 5, paragraph 3: Wildlife is discussed only as it is used by man. In a section entitled "Biophysical Resources", one would expect at least a general discussion of the intrinsic value of the estuary to wildlife.

Page 21, section 2.1.1, last sentence of the first paragraph in the section: the word "presently" in the statement"...which cannot presently be anticipated" is incorrectly used. Presently means "in the near future" as in "I will do it presently". A more correct substitution would be "currently" or "at present".

Page 23, 2nd paragraph: All agencies comprising the Coordinating Committee are already named in Fig. 3. Therefore, why waste 5 lines of text re-naming them when a simple reference to Fig. 3 would be adequate?

Page 32, last sentence on the page: "Coordinating" is spelled incorrectly.

Page 38, Section 3.1.2.1: I suggest changing "Sites possessing immediate access...." to "Currently occupied sites possessing immediate access...".

Page 40, Section 3.1.4.2: Who pays for the habitat improvements recommended?

Page 54, first sentence: I suggest changing the sentence to read, "The recomended designations of...are shown in...".

Page 38, 3.1.2.3 (?)

3.2.3.2. - It is the Ministry of Lands, Parks and Housing policy to issue a lease for a 30 year term unless valid reasons arise which indicate a shorter term.

Page 41

3.1.5. - It is our policy to encourage bundling of logs if they must go in the water, but we would prefer upland storage and sorting.

It would appear from this section that if areas are in the industrial zone and too shallow for the logs to float freely at all times, that we should require the lessee to dredge the area, keeping in mind time constraints, which the environment agencies might require.

Page 2, line 3: The Elaho River and Ashlu Creek are also major tributaries of the Squamish.

Page 5, line 2: The Squamish estuary also supports a sports fishery for searun cutthroat trout and Dolly Varden char.

Page 5, paragraph 3: More should be said about the wildlife, (birds, etc.) that utilize the estuary and their dependence on it, particularly at certain times of the year.

Page 13, paragraph 3: Responsibility re: fish should read, "...for resident fish and anadromous trout, char and other non-salmon species under authority of the federal Fisheries Act."

Page 23, paragraph 3: Will the District of Squamish member of the Coordinating Committee have the time and funds to be able to arrange an effective public involvement program?

Page 40, Section 3.1.4.2: Use of the phrase "future losses" concerns me since I don't believe that there has to be any more losses of productive habitat within the estuary.

G.3 General Comments and Recommendations Abstracted From Briefs

Comments and recommendations:

Cost benefit analysis must be an integral part of the future planning process.

Log handling must be maintained.

Compensation of land and money should be given to any user who is required to relocate.

Existing users should have priority for expansion (or relocation if necessary) (into PA 1 or 2?) before other potential users are considered.

Waterfront property should be available to only the industries which rely on water access.

Planning/Assessment Areas should not be allowed industrial development until all other possible industrial locations are exhausted. At the same time, heavy recreational use should be discouraged until all other areas are first considered. (e.g. Mamquam River campground behind old bridge to the east; Washiter Falls picnic area?)

Will the area designation map (p. 55) take precedence over the official Community Plan?

"Dredging (page 58) - The requirement in subsection #4 "appropriate monitoring" of all dredging operations appears reasonable, especially in Cattermole Creek. It should be kept in mind, however, that monitoring tests are expensive, and should only be required where justified by the movement of significant volumes of material."

Port options study - ..." the Britannia site should be considered as a vital link in the shipping and storage terminal business, already an on-site rail link (direct) and excellent deep water potential..."

"The Steelhead Society requests that a habitat reclamation performance bond be implemented to ensure that industrial activities are carefully planned and carried out with minimal/negligible effect on the estuary area, present and future."

There should be ongoing (yearly) program evaluation which should be incorporated in the Management Plan.

Breach, or remove the training dyke in order to reclaim the Central Basin for fish habitat.

"No further development of any kind should be allowed in what is left of the Squamish Estuary."

"Development already in place adjoinging the Mamquam should be intensified without expansion."

"Additional industrial land could be created by diverting the Cattermole Creek to the west side of the terminals road and adjoining rail trackage (refer to map) and infilling the present channel."

"The above infill material could be provided by salvaging the fill presently dumped on the central delta - any remainder should be utilized in the new industrial park."

"The removal of the central delta fill would allow for restoration of salmon feeding habitat."

"The B.C. Rail track "dyke" should also be similarly broken to permit restoration of habitat to the east known as the East Delta."

"B.C. Rail proposals to extend their dump yard south through Wilson Slough should not be permitted. Not only does it destroy valuable Trumpeter Swan winter habitat and the area for year round wildlife utilization, it will create undue noise pollution for residents of Dentville, and little in the way of additional employment in the area. Such modern operations are highly computerized. Also the railway in its submission to your group April 16, 1980 admits to having a better site for such an operation at Kelly Lake. Their proposal would also destroy the upper reaches of Cattermole Creek and disturb the old municipal refuse dump."

"The infilling of Cattermole Creek's present course east of Squamish Terminals will further cover the old FMC Mercury Spill and valuable dockage space could be created to the east of the present terminals docks. An expansion to the east would solve Squamish Terminal's needs and eliminate the threat to the south end of the east delta and salmon feeding grounds."

"The CRB logsort should be removed from the east delta and relocated to the Mamquam Channel. The latter is beyond reclamation anyway."

Establish "Estuary Reserves" on the same basis as Agricultural Land Reserves or Forest Reserves.

No consideration should be given to development of the dredge spoil area for public recreation because of the environmental sensitivity of the adjacent estuary lands.

Upgrade both Mamquam and Central Sewage Treatment Plants.

A national park should protect the estuary.

"There are several proposals to take areas which are productive from a natural production point of view and make them industrial/commercial areas. How many proposals are there to remove industrial and commercial enterprises from various areas and reclaim those areas for natural production?"

It is unfortunate that a realistic long-term industrial/commercial plan for Squamish had not been developed prior to or in conjunction with the plan. The land use report did deal with some of the opportunities and liabilities of the area from the point of view of industrial/commercial development, but it did not lay out or even suggest a rational industrial development strategy for the area.

Planning Assessment area has been identified as having multiple demands for its use. If the water course location was defined it could be deepened to provide access to marsh areas for fish, and channels for recreational boating, marinas and deep sea shipping, as well; additional overflow relief for the Squamish River during flood could be provided.

"Acceptable Industrial projects which must encroach on some habitat areas, should be required to compensate by bringing non-productive estuarian lands into active production, thereby preventing any slow depletion of active acreage."

"Recommendations for remedial actions on page 57, Figure 6 "Proposed Actions and Studies." These recommendations should be addressed by letter to the appropriate organizations, for their attention and action."

G.4 Summary Analysis of Responses to the Public Involvement Work Group Questionnaire

Total Number Sent: 400

Total Number Returned: 44 (11%)

Page 1:		Percent of Respondents
1. Are you a Squamish resident? If not, where do you reside?		
Squamish	35	80%
Vancouver, Lower Mainland	9	20%
2. Do you represent an organization or agency? If so, please specify.		
Affirmative	9	21%
(Conservation/recreation oriented - 6)		
(Industry oriented - 3)		
3. What particular interest do you or your group have in the estuary?		
Conservation/recreation	28	64%
Multiple resource use	13	30%
Industrial	2	4%
None specified	1	2%
	44	100%

		Percent of Respondents
4. Have you ever been involved in issues pertaining to the management of the estuary in the past?		
Affirmative	11	25%
5. Does the view of estuary management presented in the draft management plan coincide with your view of how the estuary should be managed in future years? Is there anything you would change or add?		
Do not agree with management approach/recommend changes	20	45%
Agree with management approach/ recommend changes	10	23%
Agree with management plan as presented	8	18%
No comment	6	14%
	44	100%

Nature of recommended changes:
Change PA1 designation to C
(specifically, no development on
East Delta for railyard or

		Percent of Respondents
terminal expansion, no new training dykes)	11	
Remove all present industry from the estuary	5	
Leave estuary in its present state	2	
	18	

6. Do you agree with the proposed linked management system consisting of Figure 3, page 22, Volume 1 of the Draft Plan? If not, please describe alternatives.

Agree	6	14%
Do not agree	23	52%
Not sure	6	14%
No comment	9	20%
	44	100%

Recommended alternatives/changes to the linked management system:

More public involvement desirable (less government)	11

Squamish member should not coordinate public involvement because of possible bias	6
Coordinating Committee should be more authoritative than advisory	4
Management system should be simplified but wield law enforcing powers	3
Proposed management system is weighted too heavily towards environmental concerns	2
	26

Page 2:

7. If you have any special interest in any of the following estuary uses, list below any specific comments, concerns or actions you feel should be considered as these uses are developed.

a) Port and Terminal Development:

No further expansion/future development away from estuary only	18
Would be amenable to further port development	9
Would prevent use of estuary as a port	4

A complete environmental impact study should precede new developments	3
Port/terminal facilities should be moved to another site in the I/CI	1
	35

b) Navigation and Marine Traffic Control:

Control/reduce water traffic speed	7
No control of water traffic required	3
Better channel designations required (rights-of-way, seaplane areas, etc.)	3
Move FMC operation (threat to navigation)	2
Control size/number of ships allowed in estuary	2
Allow pleasure craft only in estuary	1
Do not allow any marine traffic in estuary	1
	19

c) Dredging, Dyking and Drainage:

Dredging should not be done in the estuary (particularly in the mercury contaminated area)	10
Remove or penetrate training dyke to flush central basin	9

Would permit dredging in non-sensitive areas only after the sediment contaminant issue is resolved	8
Continued dredging recommended to provide better boat access and improve drainage	7
No further dredging, dyking, drainage should be allowed	5
No dredge spoils to be dumped into sensitive areas of the estuary	2
Industrial drainage should be diverted to settling ponds	2
	43

d) Waste Management:

Monitor/enforce all discharge requirements, upgrade present facilities, dispose of waste solids inland	22
All waste disposal should be done inland	2
Prevent road runoff to estuary	1
Incinerate municipal waste	1
	26

e) Log Storage and Handling:

Dry land log sorting recommended	15
No log storage in estuary	9
Recommend deep water log storage	7
Recommend dry land log storage	5
Keep logs out of C1 and PA1	2
No change in present situation recommended	2
Log sorting should be confined to deep water	1
	41

f) Habitat Enhancement:

Reclaim dredge spoils area	6
Clean up log dumping area	5
Promote more fresh water inflow	4
Install a salmon hatchery	3
Move sewage outfall 1B to the main Squamish channel	2
Plant eelgrass to improve biological activity	1
	21

g) Recreation Development:

Institute a general limitation to the

degree of development to preserve the natural state	18
Construct hiking/nature trails	4
Establish a nature centre facility	4
Establish a campsite at the proposed site	3
Establish limited boat launch facilities in C1	2
Expand yacht club facilities	1
	32

Percent of Respondents

Page 3:

8. **The first Draft Area Designation Map and Proposed Actions and Studies Map are presented on Pages 55 and 57 (Figures 5 and 6) in Volume 1 of the Draft Plan. Do you have any comments on either of these maps?**

Change PA1/2 to C designation	12
Expansion of Squamish Terminals should not be allowed	7
Culverts should be in proposal (to allow flushing of Wilson Slough)	7
Change outfall locations (1A,1B) to main Squamish channel	6

		Percent of Respondents
Relocate log storage/handling area	4	
Should be no provision for erosion control (dyke) in West Delta	3	
Change I/C1 to C status	3	
Change PA1/2 to I/C1 status	2	
Refuse Site 5 should be monitored (as per Site 6)	1	
	45	

9. Should Public Involvement be an ongoing activity in the Estuary Management Plan as it is implemented?

Yes	31	70%
No	10	23%
Not sure	1	2%
No answer	2	5%
	44	100%

Comments:

Present designations in the Estuary Management Plan are sufficient and need no further input	4
Public involvement should be both by appointment and continued use of public hearings	3

The public does not have the time/ability to give expert advice	3
	10

10. Do you have any specific suggestions for Public Involvement in the Management Plan? In which parts of the Management Plan is public involvement most important?

Should be more public representation to or within the Coordinating Committee	5
Volunteer workers should be organized and have direct input into management as well as enhancement	2
	7